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PLEASE NOTE

This report presents unevaluated information extracted from publications of the USSR, Eastern Europe, and China. The information selected is intended to indicate current scientific developments and activities in the USSR, in the Sino-Soviet Orbit countries, and in Yugoslavia, and is disseminated as an aid to United States Government research.

SCIENTIFIC INFORMATION REPORT

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I. BIOLOGY

1. Vitamin C Content and Dynamics Studied in 200 Types of Gladioli

"Content and Dynamics of Vitamin C in Certain Types of Gladioli Growing in the Latvian SSR," by V. Grinsteins, Zinathiskie Raksti. Latv. Univ. (Scientific Reports of Latvian University), No 9, 1956, 125-141 (Latvian, resume in Russian) (from Referativnyy Zhurnal -- Khimiya Biologicheskaya Khimiya, No 23, 10 Dec 57, Abstract No 25496)

The greatest ascorbic acid content was found in the green leaves, the least in the bracts, petals, and peduncles, and extremely insignificant amounts in the bulbs. Vitamin C content determined in various parts of 200 types of gladioli fluctuated between 400 and 1,600 mg %.

2. Hungarians Isolate Vitamin B_{12} From Alga

"Mass Cultivation of Fresh-Water Algae: Source of Nutrition for Future Generations," by Dr Harald Tangl and Dr Laszlo Machay, Budapest, Termeszettudomanyi Kozlony, No 6, Sep 57 p 314

The Phylaxia Serum Producing Institute (Phylaxia Oltoanyagtermelo Intezet) recently succeeded in isolating nearly one gamma [microgram?] of vitamin B_{12} per gram of alga from Chlorella vulgaris.

3. Hydrobiological Studies in Yugoslavia

"The Man Who 'Discovered' Lake Ohrid," by K. Corbe, Skoplje, Nova Makedonija, 9 Mar 58, p 6

The discoveries by Dr Sinisa Stankovic concerning the flora and fauna of Lake Ohrid began to be noticed by European biologists in 1927. In 1935, he founded the Hydrobiological Establishment, whose prime function was to investigate the unique marine life in the lake. The results of these studies will be collected and published as a book in Belgrade and Skoplje in the Serbo-Croatian and Macedonian languages.

Lake Ohrid conceals in its constantly cold depths many unusual forms of life which have died out elsewhere in the world. Special equipment has brought to the surface many small snails and crawfish, some of which are

blind due to adaptation to the constant darkness. In recent years, study has been devoted to the plankton in the surface waters of the lake. It has been found to consist primarily of microscopic algae and crawfish, which constitute the most important source of food for the fish.

4. Recent Hungarian Research in Biology and Medicine

"New Hungarian Research Results in Biology and Medicine," by Dr Imre Toro, academician, Budapest, Nepakarat, 29 Dec 57, p 5

The author summarizes recent developments in research biology and medicine as follows:

In their studies of monocellular organisms and the origin of proteins, Hungarian biologists have developed a technique which enables them to observe in a glass vessel the process by which protein is formed. Also, they have succeeded in demonstrating structural variations in similar proteins occurring in different species.

With the aid of radioactive isotopes, satisfactory progress has been made in the study of the chemical elements of cell multiplication.

New results have been achieved in recognizing the function of the thymus.

A striking similarity has been discovered between the operation of the cell structure of the cortex and the mechanism of the electronic computer. This fact will make possible further successful research on the physiology of the cortex. The results are of significance in recognizing the behavior-biology of organisms.

Researchers have been able to locate the brain centers which inhibit the sense of direction of living beings.

In the field of heredity, researchers are studying the problem in both humans and bacteria. In the latter field, they have been able to direct heredity with chemicals; in the former, they have conducted investigations on twins.

In the field of plant heredity, outstanding results have been achieved with peas, rye, and corn.

An entirely new form of anesthesia was discovered as the result of the use of the substance called "capsaicin."

An exploration of caves disclosed the presence of 72 varieties of mushrooms all of which produced antibiotics. Some of these have proved to be very effective.

Botanists have developed a variety of poppy which yielded 6.5 percent more morphine per quintal in mass tests than previously known varieties.

In the course of kidney and muscle research, scientists have succeeded in determining the regulatory mechanism governing the nervous system of the kidneys.

As a result of the study of many healthy and diseased organs, it has been demonstrated that the circulation of lymph is similar in importance to the circulation of blood. The establishment of this fact has made possible the analysis of a number of pathological conditions, the essence of which was previously unknown.

Much successful research has been done in the field of ulcerous diseases and asthma.

Researchers have had good results in treating certain diseases by artificially cooling the system.

Several new techniques have been evolved for the early and precise detection of cancer. Furthermore, the Hungarian drug "Degranol" shows great promise in the treatment of cancer.

5. Date Changed for Conference on Biological Action of Ultraviolet Radiation

"Announcement" (unsigned article), Moscow, Biofizika, Vol 3, No 1, 1958, p 128

The date of the Conference on the Biological Action of Ultraviolet Radiation, which is to be held in Leningrad, has been changed from 27-30 May 1958 to 3-6 June 1958.

II. CHEMISTRY

Industrial Chemistry

6. Production of Rare Metals and of Metals Present in Low Concentrations

Khimiya i Progress Tekhniki (Chemistry and the Progress of Technology), by D. Yu. Gamburg, Candidate of Chemical Sciences, Znaniye, Moscow, 1957, 24 pp

This popular booklet on the role played by chemistry in the progress of technology gives the following information:

The elements uranium, germanium, beryllium, selenium, cesium, rubidium, and gallium are bringing about new changes in technology. For instance, during recent years the application of germanium has resulted in radical changes in electrical engineering. The replacement of vacuum tubes, which break easily and are difficult to manufacture, with small-sized and long-lived germanium crystal diodes and transistors has made it possible to reduce considerably the size of radio receivers, television receivers, calculating machines, and radar equipment. The application of germanium semiconductors improved the operation of all these devices and at the same time reduced the amount of electric power needed to operate them. This is of considerable technical and economic importance.

The importance of germanium can be illustrated by the fact that a content of this element amounting to 0.001-0.002% in some coal ashes is regarded as adequate from the standpoint of the industrial production of germanium from these ashes.

The elements cesium and rubidium are used extensively in technology, in telemechanics, and in television.

Semiconductor elements are used extensively for the production of thermoelements which convert heat energy and light energy directly into electric power.

The elements which have been mentioned are also responsible for considerable changes in metallurgy. For instance, their addition to steel makes it possible to obtain the most diverse and sometimes unexpected changes in the characteristics of the steel.

The metals niobium, tantalum, beryllium, lithium, and magnesium have acquired a very great importance in metallurgy.

Beryllium bronzes have a great resistance to wear. Beryllium oxide refractories are distinguished by a high melting point and great stability to corrosion, so that they can be successfully used in nuclear energy technology. Niobium and tantalum are high-melting metals which can be successfully subjected to cold working, stamping, and cold drawing. These metals have an exceptionally high corrosion resistance. The carbides of niobium and tantalum are used in superhard alloys for cutting tools.

Magnesium, in addition to aluminum, is being used extensively in the metallurgy of light and very light alloys. The addition of magnesium to cast iron makes it possible to obtain cast iron of exceptional strength. As far as mechanical strength is concerned, this cast iron approaches steel in its characteristics, while preserving the special properties that make it suitable as a construction material.

Lithium and its compounds are beginning to acquire a special place in present-day metallurgy. A small addition of lithium hydroxide increases the power output of electrical storage batteries and prolongs their useful life. Greases which contain lithium soaps preserve their lubricating characteristics at temperatures from 60° below zero to 120° above zero. The most important application of lithium is in the future and consists in the use of this metal for the production of tritium to be employed in thermonuclear reactions.

The technological progress brought about by titanium in present-day metallurgy can only be compared with that which followed the introduction of aluminum and magnesium. The mechanical strength of titanium and of its alloys is as high as that of steel, and the specific weight of this metal is only half that of steel. Furthermore, titanium has a very high resistance to heat. Because of its characteristics, titanium and its alloys will be excellent structural materials for aircraft.

Titanium is resistant to corrosion, which makes it an unmatched material for applications in the chemical and petroleum industries, reaction motor technology, the construction of gas turbines, and ship building. The resources of titanium in the earth's crust are three times higher than those of chromium, vanadium, zinc, copper, and manganese taken together.

In addition to increasing the range of elements which can be used, the chemical industry has developed new methods for the concentration of elements found in deposits where they occur in such low concentrations that the exploitation of these deposits was considered impracticable until recently. The industrial exploitation of lead, copper, zinc, silver, and gold deposits was formerly limited to occurrences of these metals in concentrations 5,000-10,000 times higher than the average content of the metals in the earth crust. As a result of new methods of concentration and extraction, it is possible at present to exploit deposits in which the

metals are present in concentrations that are much lower. Furthermore, the most diverse methods are used for the utilization of wastes. For instance, a thermal power station of medium capacity which burns 1,500 tons [per day] of coal with a high ash content releases daily into the air more than 300 tons of the finest dust and 100 tons of sulfur dioxide, which contaminate the surrounding area. The valuable metals germanium and gallium can be recovered from this dust and sulfuric acid can be produced from the sulfur dioxide (pp 11-12).

Indium, thallium, gallium, and germanium are produced from the fly dust and other wastes of copper smelters, zinc plants, and sulfuric acid plants (p 14).

When processes for the complete utilization of copper, tin, lead, and other ores are applied, the metals tungsten, molybdenum, antimony, cobalt, cadmium, bismuth, and indium are obtained as by-products. Complete utilization of iron ores that contain titanium and vanadium makes the blast-furnace slags which result from the conversion of such ores a valuable raw material for the production of these metals. (pp 15-16)

[SIR Note: This account is of interest from the standpoint of actual attempts made in the USSR to recover useful elements from industrial wastes. For instance, several investigations have been published in USSR technical periodicals recently on the concentration and recovery of germanium present in coal.]

7. Use of Ion Exchange Resins in Technology of Inorganic Salts

"Trends in the Development of the Technology of Inorganic Salts," by Prof M. Ye. Pozin and B. A. Kopylev, Candidate of Technical Sciences; Moscow, Khimicheskaya Nauka i Promyshlennost', Vol 2, No 6, Nov-Dec 57, pp 677-686

Recent developments in the separation of salts by flotation, the separation of salt suspensions in hydrocyclons, the conversion of salt solutions at high temperatures and pressures, the application of ion-exchange resins in the technology of inorganic salts, the production of salts by the treatment of aqueous suspensions with gases, and the production of some new salts (particularly polyphosphates) are reviewed on the basis of both USSR and Western work. A bibliography consisting of 46 USSR references and 74 non-USSR references is appended to the article.

The section on hydrocyclons deals principally with the treatment of potassium salts. It is mentioned that hydrocyclons can be applied in the enrichment of uranium ores.

The section on the application of ion-exchange resins describes in some detail the purification of lithium nitrate from sodium and potassium by means of a para-phenolsulfonic acid cationite followed by conversion to lithium carbonate, the purification of zirconium and bismuth salts by filtration through cationites, and the concentration of vanadium, gold, platinum, and palladium by means of anionites. It is pointed out that separation and purification of bismuth, tungsten, tin, and antimony salts can be accomplished with the aid of either anionites or cationites because of the amphotheric nature of the oxides of these metals. Procedures for the concentration of boric acid from natural brines and industrial wastes are discussed. At the conclusion of the section the possibility of introducing ion-exchange resins continuously into the process, so that the necessity of interruptions for the purpose of the regeneration of the resin will be eliminated, is mentioned on the basis of American publications. The subject of selective ion-exchange resins and the application of ion-exchange diaphragms, membranes, and films is also discussed. It is stated on the basis of US publications that ion-exchange diaphragms (membranes) can be used for the desalting of saline waters and sea water and for the extraction of iron from pickling solutions.

In the section on the production of new salts, it is stated that the increased demand for fluorine to be used in the production of agricultural poisons has reopened the question in regard to the recovery of by-product fluorine in connection with the conversion of phosphates: the methods that have been developed, by means of which sodium fluorosilicate is produced from the fluorine-containing gases of superphosphate plants, can no longer be regarded as universally applicable. The author says that absorption of fluorine by limestone deserves attention as an industrial process for the production of calcium fluoride that is to be used as a starting material for the production of fluorine compounds or as an additive to cement.

8. USSR Review of Technology of Fluorine Compounds

"Trends in the Technology of Fluorine Salts," by M. G. Gabriyelova, Candidate of Technical Sciences; Moscow, Khimicheskaya Nauka i Promyshlennost, Vol 2, No 6, Nov/Dec 57, pp 722-726

This article reviews applications of fluorides, the production of fluorine and hydrogen fluoride, raw materials for the production of fluorine, industrial methods for the production of fluorides, the utilization of industrial waste products containing fluorine, the fluorination of concrete, and the chemistry and applications of fluorides produced in small quantities. A bibliography consisting of 14 USSR references and 14 non-USSR references (including references to publications translated into Russian) follows the text of the article.

In reviewing the non-USSR literature on applications of fluorine, the author says that many newly investigated physicochemical properties of various fluorine compounds and new technological applications of these compounds are mentioned in the publications in question. On the basis of the scientific research which has been done in this field, novel technological methods for the production of new compounds have been developed. However, insufficient data on the volume of the production of these compounds are given in the literature. This is explained by the fact that many fluorine compounds are used for purposes connected with national defense and in the nuclear energy technology (e. g., uranium fluoride, boron fluoride, etc.). The author points out that methods of fluorination by means of elemental fluorine or hydrogen fluoride are applied in the synthesis of many organic compounds. Because of this there has been a rapid and extensive expansion in the production of fluorine and hydrogen fluoride, which represent the initial products for the synthesis of various fluorine compounds.

In the section on the production of fluorine and hydrogen fluoride, materials which are least susceptible to corrosion by fluorine and hydrogen fluoride and best suited for the construction of chemical equipment exposed to the action of these substances are listed. It is stated that the best materials from this standpoint are chromium-nickel and chromium-nickel-molybdenum steels of different grades, copper-nickel alloys, nichron, and niobium; as far as nonmetallic materials are concerned, graphite, grapholite, carbon impregnated with phenolic resin, polyisobutylene, and polyethylene are best.

In the section on raw materials for the production of fluorine, the conversion of fluorspar and the recovery of fluorine from waste gases of the phosphate fertilizer industry are reviewed. It is pointed out that the waste gases of phosphate fertilizer plants are the principal source of fluorine in the chemical industry. In the part of the article dealing with methods of production, the thermal, soda suspension, and potassium carbonate methods are reviewed in detail on the basis of USSR work and USSR publications. The thermal method, which has been proposed by S. I. Vol'fkovich, consists in the production of sodium fluoride by the thermal decomposition of sodium fluorosilicate. The gaseous silicon fluoride which forms is recirculated. The soda suspension method is based on the interaction of calcined soda with sodium fluorosilicate. The crystals of sodium fluoride are separated by means of a hydrocyclone according to a method developed by the Ural Scientific Research Chemical Institute. The production of sodium fluoride by the potassium carbonate method is based on the treatment of silicon fluoride with potassium carbonate followed by a conversion of the potassium fluoride that is formed into sodium fluoride by means of sodium carbonate.

A method for the recovery and decomposition of silicon fluoride by means of aqueous ammonia on the basis of a procedure developed by the State Institute of Applied Chemistry is described. The second half of the section on production methods discusses methods for the production of synthetic cryolite. Three methods are discussed: the ammonia method, the carbonate method, and the acid method. The discussion of cryolite production is concluded with the description of a method for the production of aluminum fluoride by means of fluoroboric acid.

In the section on the fluorination of concrete, methods for the treatment of concrete with silicon fluoride are described on the basis of USSR, German, and French publications. This treatment, which is carried out at a pressure of 4-6 atmospheres with the use of freshly generated, dry SiF_4, increases the mechanical strength of the concrete and improves its resistance.

In the discussion of the production of fluorides produced in small quantities, the following information is given:

Among fluorides which are produced in small quantities but are nevertheless very important, one may mention uranium hexafluoride, magnesium fluoride, lithium fluoride, sulfur fluoride, chlorine fluoride, and boron fluoride.

Uranium hexafluoride is produced by the fluorination of the uranium oxide U_3O_5 with elemental fluorine from which all impurities have been eliminated. In the process of fluorination, which is conducted at 400°, by-products are formed in addition to UF_6, specifically uranium oxyfluoride UOF_4. The separation of these by-products is accomplished by cooling the reaction gases to very low temperatures. As a result of this cooling, UF_6 is deposited in the form of a white powdery mass. The gaseous products which do not condense are recirculated. The simplest method of producing the fluorides of alkali and alkaline earth metals is based on the interaction of oxides, hydroxides, and carbonates of these metals with an aqueous solution of hydrogen fluoride.

In connection with the development of the production of anhydrous hydrogen fluoride on an industrial scale, a number of fluorine compounds including TiF_4, ZrF_4, NbF_5, TaF_5, VF_4, SnF_4, and SbF_5 are produced by the treatment of the chlorides of these metals with anhydrous hydrogen fluoride. A number of fluorine compounds including BiF_5, SF_6, SeF_6, Os_5F_8, IrF_6, CrF_4, and CrF_5 are produced by using elemental fluorine. Elemental fluorine is also used in the synthesis of the halogen compounds of fluorine. A prominent place in the industry of fluorine compounds is occupied by the production of freons. The production of fluorine plastics, which possess very valuable properties (resistance to fire, insolubility in organic solvents, hardness and stability toward chemically active agents), is being advanced. Also, the production of fluorinated hydrocarbons used as electrical insulating materials is expanding.

At the conclusion of the article the author reviews current developments in the field of fluorine technology as follows:

The principal trends in the development of the production of fluorine compounds are characterized by an expansion of the range of available fluorine salts, for the production of which industrial gases containing fluorine can be used to a major extent. On the basis of the fluorine compounds which are produced, various inorganic and organic compounds can be prepared, the possibilities for the application of which are constantly increasing.

A task of the greatest importance is the production of cryolite and of aluminum fluoride by means of new technological processes which will make it possible to (a) utilize the gases of the superphosphate production and (b) eliminate the use of sulfuric acid and of fluorspar.

Instead of sodium fluorosilicate, which has lost its importance as far as agricultural applications are concerned, it is necessary to produce other fluorosilicates, namely, those of ammonium, magnesium, and zinc, which are used in the economy as antiseptics and fluxes.

The scientific research work on the technology of fluorine compounds that is done must concentrate on investigation of the process of the conversion of silicon fluoride to hydrogen fluoride, taking into consideration the unlimited possibilities of applying the latter in technology.

In conjunction with the expansion of the production of phosphate fertilizers, the production of fluorides must become an extensive branch of the chemical industry.

9. Properties and Applications of Polyfluorethylene and Polyethylene Plastics Manufactured in USSR

Materialy Neogranichennykh Vozmozhnostey (Materials of Unlimited Potential), by Docent B. Ya. Rozen, Candidate of Chemical Sciences; Znaniye, Moscow, 1957, 39 pp

In searching for heat-resistant plastics, chemists succeeded in synthesizing new materials which have properties superior to those of organosilicon compounds. These plastics, known as fluorine plastics, represent polymers of ethylene in the molecules of which the hydrogen atoms are completely or partially replaced by fluorine atoms. Ftoroplast-4 [fluorine plastic-4] and ftoroplast-3 [fluorine plastic-3] are now being produced by USSR plants.

Ftoroplast-4 (sometimes called teflon) is a whitish gray mass which is somewhat translucent in thin layers; it feels like paraffin. Teflon plates, disks, and rings can be employed as high-frequency insulation for coils, condensers, and slots of electric equipment. Insulation materials made from ftoroplast-4 are not moistened by water and do not swell in it, so that they can be used at high humidities.

As distinguished from some other plastics (polyethylene, polystyrene, etc.) ftoroplast-4 does not become fluid at high temperatures. Articles made from ftoroplast-4 are not combustible and do not change their shape on heating up to 350°.

Having an exceptionally high chemical stability, teflon is not affected by strong acids or strong alkalies. It remains unaffected even by hot concentrated nitric acid or a mixture of nitric acid with hydrochloric acid. In view of the fact that this plastic is superior to gold and platinum as far as its resistance to chemical corrosion is concerned, it is occasionally referred to as a noble metal plastic.

Ftoroplast-4 is insoluble in organic solvents and in water. It decomposes only under the action of metallic sodium, gaseous fluorine, or chlorine trifluoride. Even then, it is affected only at elevated temperatures. In addition to a high heat stability, ftoroplast-4 has a high resistance to cold. Articles made from teflon not only are unaffected by the lowest temperatures encountered outside, but also do not exhibit any brittleness at the temperature of liquid air (minus 190°). Ftoroplast-4 is subject to high residual deformations. These deformations are already noticeable at a pressure of 30 kilograms per square centimeter. At a pressure of 100-200 kilograms per square centimeter, this resin can be rolled into thin films. During the rolling, the area of the resin increases to 3-3.5 times the original area without the formation of cracks or fissures.

Because of its suitable physicomechanical and chemical properties, ftoroplast-4 can be applied extensively in technology, specifically in the chemical and pharmaceutical industries, in refrigeration, in the food industry, in electronics, and in aviation. It is particularly suitable for the production of parts serving for the tightening of pipe connections, pumps, and other equipment used for the transmission of fluids.

Parts for chemical equipment are made from ftoroplast-4. Pipes and tubes made from this material are exceptionally strong. For instance, a teflon pipe of a small diameter with a wall thickness of 1.5 millimeters can stand a pressure of higher than 15 atmospheres.

Because ftoroplast-4 does not swell in any known liquid, products made of it can be kept for months in any corrosive or otherwise aggressive liquid.

Porous teflon filter plates have been found very useful at industrial plants. The production of these plates is very simple. The polymer is pressed together with some powdered salt. When the plate has been manufactured, the salt is washed out of it. Depending on the quantity of salt added, one may produce materials with various degrees of porosity.

Because of the lack of odor, stability toward liquids and fats, and absence of adhesion to the most sticky substances, teflon has properties that are of advantage from the standpoint of the application of this material in the food industry. It is also used in medicine as a substitute for bones and cartilage in restorative surgery, etc.

Because of the insolubility and high thermal stability of ftoroplast-4, products made of it cannot be manufactured like other plastic products: special methods must be applied. Thus, machine parts can be manufactured by cold pressing of the finely dispersed granular polymer under a pressure of 200 atmospheres or higher. The manufactured products are then baked by keeping them for several hours at a temperature of 360-375°.

Ftoroplast-3 differs from ftoroplast-4 in its appearance and properties. Ftoroplast-3 is a horny material which is supplied in various shades ranging from colorless to brown. The shade depends on the duration and temperature of the treatment. This plastic melts at 210°, although it is harder than ftoroplast-4 at room temperature. As distinguished from ftoroplast-4, ftoroplast-3 does not flow at low temperatures and does not possess a high mechanical strength or hardness. However, the hardness of products made of ftoroplast-3 can be considerably increased by heat-hardening. The elongation of thermally hardened products made of ftoroplast-3 is increased by a factor of 5. Ftoroplast-3 is transparent even in thick layers. It is particularly important that this resin can be treated by any known method applied in the working of plastics, viz., pressure-molding, casting, or injection molding.

Because of the low plasticity of ftoroplast-3 and its higher tendency to crystallize, the pressing of products made of it must be conducted at a higher temperature than the pressing of other plastics. The working temperature in presses should be 220-260°. High pressures are commonly used: these must amount to 500-700 atmospheres. The special characteristics of this resin requires rapid chilling after pressing. The products are cooled to 100-120° in the molds and then additionally cooled to room temperature. For this purpose they are taken out of the molds and placed on wooden or textolite planks.

Ftoroplast-3 is used substantially for the same purposes and applications as ftoroplast-4. In addition to that, it is used as a material for diaphragms of storage batteries, transparent peephole covers, linings for equipment which operates at high pressures, and noncorrosive coating for metals. Steel coated with ftoroplast-3 is often used as a substitute for stainless steel, silver, or gold.

Coatings from ftoroplast-3 adhere well to glass, porcelain, and ceramics.

The superior characteristics of fluorine plastics, i.e., high chemical stability, a long useful life, impermeability to water, and a high dielectric constant, are also exhibited by polyethylene. The production of polyethylene-1 with a molecular weight of 18-25,000 and of polyethylene-2 with a molecular weight of 28-35,000 has been organized in the USSR. In addition to that, the so-called cable polyethylene, a mixed polymer of ethylene and isobutylene, is produced in the USSR.

All types of polyethylene are highly resilient. Even in very cold weather, one may bend a strip made of this type of plastic around a cylinder with a diameter of 4 millimeters without producing any cracks or breaks. However, with rising temperatures the resiliency of polyethylene resins becomes worse. Their breaking strength on elongation is also reduced.

Polyethylene-1 and cable polyethylene differ from polyethylene-2 in some of their physicomechanical properties. These two grades are more plastic and have a greater elongation, so that their fabrication into articles is easier in many cases. By subjecting polyethylene to a pressure of 30 atmospheres on hydraulic presses at a temperature of 140-150°, sheets with a thickness of 1-20 millimeters are produced and blocks with a thickness of 20-150 millimeters as well as many single-piece parts and objects. Thin sheets with a thickness of 0.3-3 millimeters are manufactured by the shaving of large polyethylene blocks on special machines. Polyethylene tubes, robs, and films are produced by extrusion. Most frequently, polyethylene is molded under pressure. Pressure molding is done by exposing the material for 10-20 seconds to a temperature of 150-180° under pressure. The finished products are cooled for about the same period of time. Polyethylene is used for the manufacture of parts of chemical equipment: it resists the action of strong inorganic acids (sulfuric, hydrochloric, and phosphoric acids) as well as that of caustic alkali. It is sensitive to concentrated nitric acid, however. Polyethylene is also resistant to the action of solutions of salts, hydrogen peroxide, and formaldehyde. It is used for the production of coatings for equipment which serves as substitutes for lead and bronze coatings. Polyethylene is also used as a packaging material in the food industry and for other purposes.

For some time, polyethylene has been used in the USSR as an insulator in television receivers, replacing the formerly used polystyrene. Excellent insulating material is made from polyethylene for high-frequency cables used in television and for radar equipment; it is also applied for the manufacture of sheathes to be used on subterranean cables and cables submerged in water. The use of a polyethylene insulated high-frequency telephone cable makes it possible to increase the number of simultaneous conversations over every cable pair by a factor of almost 25.

When a fine polyethylene powder is heated, its particles melt and become plastic and adhesive. When the particles are projected in this state against a surface, they form a very strong bond with the surface and adhere to it with the result that a continuous coating is applied. Using this principle, one can protect metals from corrosion and protect stone, concrete, and wood from deterioration by applying polyethylene coatings by the method of flame-spraying. The polyethylene powder is blown by compressed air through a spraying pistol which comprises an acetylene burner. This spraying pistol operates at a pressure of 3-5 atmospheres. To insure a uniform coating, spraying is done perpendicularly to the surface being sprayed. (pp 16-21)

10. Conversion of Boron Minerals in USSR

"Conversion of Boron Crude Materials," by Prof L. Ye. Berlin; Moscow, Khimicheskaya Nauka i Promyshlennost', Vol 2 No 6, Nov/Dec 57, pp 726-733

Borate crude materials found outside the USSR and in the USSR are discussed in detail. It is pointed out that the borate crude materials available in the USSR are different from those occurring outside the USSR, so that different methods must be applied for their conversion. In connection with this, the statement is made that all borate crude materials which are converted outside the USSR contain more than 35% of B_2O_3 and are almost free of harmful impurities which interfere with their industrial conversion. The production of boron fertilizers is emphasized. Methods for the conversion of Inder raw materials (a mixture of a number of borate minerals) into boric acid, boron fertilizers, and borax and the production of boric acid from Inder hydroboracite are described. This is followed by a description of the conversion of datolites to boric acid, borax, boron-datolite fertilizer, boron superphosphate, and boron double superphosphate.

As far as the supply of boron crude materials in the USSR is concerned, it is stated that until 1932 the belief was prevalent that no deposits of industrially exploitable high-quality raw materials exist in the USSR. Subsequently, small deposits of datolites were discovered in the Northern Caucasus, and the discovery of borate deposits at Inder made the USSR independent of exports of boron crude materials. The Inder deposits were still inadequate for the development of a production of boron chemicals that would satisfy the demand for them. The discovery in 1944 of major datolite deposits in the Far East radically changed the situation in this respect: now prerequisites exist for the production of boron compounds in sufficient quantities.

The article is concluded with the statement that the USSR has a sufficient supply of raw materials and has developed methods for the conversion of domestic crude materials which make it possible to develop the production of boron compounds to an extent that would completely satisfy the demands of industry and agriculture. According to the author, the immediate tasks in connection with the development of the USSR boron chemicals industry involve the following steps:

1. Completion of the construction of installations for the production of magnesium borates and of the first plant department at which datolite will be converted to boric acid and borax; designing and construction of new boric acid plant departments of higher capacity.

2. Acceleration of the designing and planning of plant departments at which boron-datolite and boron double superphosphate fertilizers will be produced.

3. Improvement of available methods for the utilization of all types of boron crude materials, including those which cannot be decomposed readily.

4. Theoretical research which would give deeper insight into technological processes.

5. Development of methods for the concentration of boron contained in crude materials with a low boron content.

6. Search for new sources of readily accessible high-quality borate minerals.

[SIR Note: The site of the boron minerals deposits to which reference is made in the article, Lake Inder, is near the Ural River north of the town of Gur'yev.]

11. Procedure for Recovery of Silicon Tetrachloride From Waste Gases of Aluminum Chloride Production

"Results of a Competition for the Best Work in Chemistry and Chemical Technology," by Prof G. A. Rudakov; Moscow, Khimicheskaya Nauka i Promyshlennost', Vol 2, No 6, Nov/Dec 57, pp 789-791

In June 1957 the Presidium of the Central Administration of the All-Union Chemical Society imeni D. I. Mendeleyev confirmed the recommendations made by the jury in regard to the award of prizes for the best work in the fields of chemistry and chemical technology done in 1956. A second prize was awarded to Sh. S. [probably S. S.] Shchegol', G. G. Rabovskiy, Yu. M. Movshevich, M. V. Demidov, Ye. M. Spektor, V. N. Borshchevskiy, N. B. Ballo, S. I. Vichkankina, I. Ye. Shchegol', O. Ya. Kulakova, I. I. Kuzmicheva, and G. L. Groshev (Dzerzhinsk) for the work titled "Extraction of Silicon Tetrachloride From the Waste Gases of Furnaces for the Chlorination of Kaolin in the Production of Aluminum Chloride," which is of great economic importance. Application of the method in question in the industry will make it possible to produce a large quantity of silicon tetrachloride from wastes which were not utilized industrially hitherto.

12. Kerosene Used for Recovery of Silicon Tetrachloride

"A Conference on Methods for the Purification of Industrial Effluents and Waste Gases," by G. M. Strongin, Moscow, Khimicheskaya Nauka i Promyshlennost', Vol 2, No 6, Nov/Dec 57, pp 784-785

A conference on the purification of industrial effluents and waste gases was held at Dzerzhinsk in 1957. The conference had been organized by the Gor'kiy Oblast Administration of the All-Union Chemical Society imeni D. I. Mendeleyev. At this conference S. S. Shchegol' and B. G. Rabovskiy reported on an original method for the recovery of carbon tetrachloride from the waste gases of aluminum chloride production by absorption in kerosene at minus 15° followed by distillation. Commercial carbon tetrachloride is produced by this method.

13. Production of Silicon Tetrachloride and Methyl Chloride as Technological Basis for Industrial Manufacture of Organosilicon Compounds

"Valuable Materials -- Organosilicon Compounds Should Be Used More Extensively," by K. Andrianov, Doctor of Technical Sciences; Moscow Promyshlenno-Ekonomicheskaya Gazeta, No 74 (218), 21 Jun 57

"Under the Sixth Five-Year Plan, it is planned to increase considerably the production of materials needed in the national economy. Among these materials are organosilicon polymers, i.e., liquids, lubricants, resins, varnishes, elastomers, etc.

"During the past 10 years, special laboratories have been organized in the USSR in which practicable methods were developed for the industrial production of organosilicon compounds. The characteristics of these polymers have been investigated and efficient applications for them established. At present more than 50 different organosilicon materials are being produced. These materials can be used to advantage in precision casting. The simplest organosilicon compound, i.e., the ethyl ester of orthosilicic acid, makes it possible to produce cast machine parts which do not require subsequent mechanical working. When one ton of precision-cast products is manufactured, the rolling of more than 2 tons of metal is saved. Furthermore, 600-800 normal man-hours are saved which would otherwise be used in the mechanical working of the machine parts, so that an economy of 3,500—4,000 rubles is achieved.

"On the basis of 500,000 tons of rolled metal per year, the application of organosilicon compounds for precision casting makes it possible to save 75,000 tons of metal. Two thousand workers are freed in connection with this from work which requires a lot of labor.

"Organosilicon compounds serve as a material for the production of heat-resistant electrical insulation materials to be used for electrical equipment, transformers, and as insulation for electrical cords and cables. Materials of this type make it possible to operate for a longer time coal combines, electrical traction motors, high-power turbogenerators, and other electrical equipment. Thus, the use of organosilicon insulation on electrical cutting machines makes it possible to increase by a factor of 2.2 the useful life of electric motors which operate under unfavorable conditions and to increase their hourly power output 40%.

"The high resistance to moisture makes organosilicon materials irreplaceable for marine electrical equipment, an application in connection with which especially stringent requirements must be fulfilled as far as resistance of the insulating materials to moisture and water is concerned. With the use of the new type of insulating materials, the working temperature of dry transformers can be raised to 180-200°, with the result that a considerable economy of copper and other materials is achieved.

"Liquid organosilicon products (elastomers and varnishes) form a basis for the production of materials which do not change their physicochemical characteristics within a wide range of temperatures (from minus 60° to plus 250° and in some cases even to plus 550°). This is of exceptional importance from the standpoint of applications in a number of new fields of technology.

"In connection with the production of intermediate products (alkylchlorosilanes and arylchlorosilanes) a number of by-product organosilicon compounds is formed. Industrial methods have been developed whereby these by-products are utilized for the production of waterproofing (water-repellent) materials. These materials endow fabrics, leather, construction materials, and paper with the capacity of not being moistened by water while their impermeability to air is preserved.

"Notwithstanding the progress which has been made in developing the technology of organosilicon compounds, the level of the production of these compounds lags behind the ever-increasing demands for products of this type on the part of the national economy. This demand is satisfied only to the extent of 40-50%. The shortage of organosilicon compounds is felt primarily by the electrical engineering and machine-building industries. There is also a shortage of organosilicon compounds for the production of waterproof fabrics, waterproof construction materials, lubricants, etc.

"What are the reasons for this lag? One must point out that for the production of organosilicon materials and of products made of these materials extensive mutual cooperation of many branches of the industry is necessary. The absence of sufficient contacts between different organizations which produce the raw materials, intermediate products, organosilicon materials, and machines based on them [sic] is a serious shortcoming which delays the development of this important branch of technology.

"Furthermore, there is a serious lack of correspondence between the possibilities of the production of new materials of this type (primarily electrical insulation materials, heat-resistant varnishes, and the ethyl ester of orthosilicic acid) and the supply of the fundamental crude materials, viz., methylchloride and silicon tetrachloride, which is available to the production branches in question. Notwithstanding this, there are objective possibilities of increasing the supply of these crude materials. Thus, silicon tetrachloride may be produced in considerable quantities in connection with the chlorination of ores and the utilization of the wastes of aluminum chloride production. This will not only provide crude material for the production of organosilicon compounds but also raise the technicoeconomic indices of the plant departments producing aluminum chloride.

"It is advisable to coordinate the production of methyl chloride with the output of organosilicon compounds and with other types of production, because in connection with the production of methyl chloride other products are formed which are needed in various branches of technology."

14. Review of Technology of Salts of Oxygen Acids of Chlorine

"Production of Salts of the Oxygen Acids of Chlorine," by Prof G. A. Dmitriyev; A. I. Kachalov, Candidate of Chemical Sciences, and A. G. Simon; Moscow, Khimicheskaya Nauka i Promyshlennost', Vol 2, No 6, Nov/Dec 57, pp 743-750

This article reviews the technology of hypochlorites, chlorites, chlorates, perchlorates, and chlorine dioxide on the basis of work done outside the USSR, mainly in the US. A bibliography consisting of 5 USSR references and 53 non-USSR references is appended to the article. USSR work on the direct electrochemical oxidation of hydrochloric acid to perchloric acid is mentioned, and work on the direct electrochemical oxidation of chlorides to perchlorates is discussed on the basis of a USSR paper. In connection with US industrial developments in the field of perchlorates, the production of ammonium perchlorate in the US is mentioned and the statement made that this salt is used in the manufacture of explosives and rocket propellants.

The prospects of the development of the industry of oxygen compounds of chlorine in the USSR are discussed as follows in the concluding part of the article:

"The production of salts of the oxygen acids of chlorine has progressed to a certain extent in the USSR after World War II. However, the supply of chemicals of this type still lags behind the demand for them on the part of the national economy.

"The production of herbicides, defoliants, and sodium chlorite and chlorine dioxide can be based at present only on a large-scale electrochemical production of sodium chlorate. For this reason it is advisable to organize a high-tonnage production of the salts mentioned in regions where cheap hydroelectric power is available. One must accelerate the development of a large production of chlorine dioxide and sodium chlorite, because the application of these chemicals will make it possible to improve greatly the quality of textile products, paper, flour, fats, and other products.

"The most important tasks of scientific research and experimental work in connection with the production of salts of oxygen-containing acids derived from chlorine consist in the development of efficient technological methods and processes, the automatization of these processes, further improvement of the design of equipment, and the development of new corrosion-resistant materials.

"Greater attention must be paid to processes for the production of new salts of the oxygen acids of chlorine, which are used on a constantly increasing scale in industry and in agriculture.

"Very timely is also the organization of scientific research with the purpose of developing methods for the synthesis of oxides of chlorine from the elements by gas discharges, the action of ionizing radiation, and photochemical methods. Investigations in this field will make it possible to utilize directly in technology the oxides thus obtained and to develop technological procedures of the greatest efficiency for the production of salts of the oxygen acids of chlorine."

15. Hungarian Industrial Silicone Based on Soviet Research

A Vacuumtechnika Uj Vegyi Anyagai (New Chemical Materials for Vacuum Technology), by Laszlo Korosy, Engineers Advanced Training Institute (Mernoki Tovabbkepzo Intezet), Budapest, 1954, pp 69-73

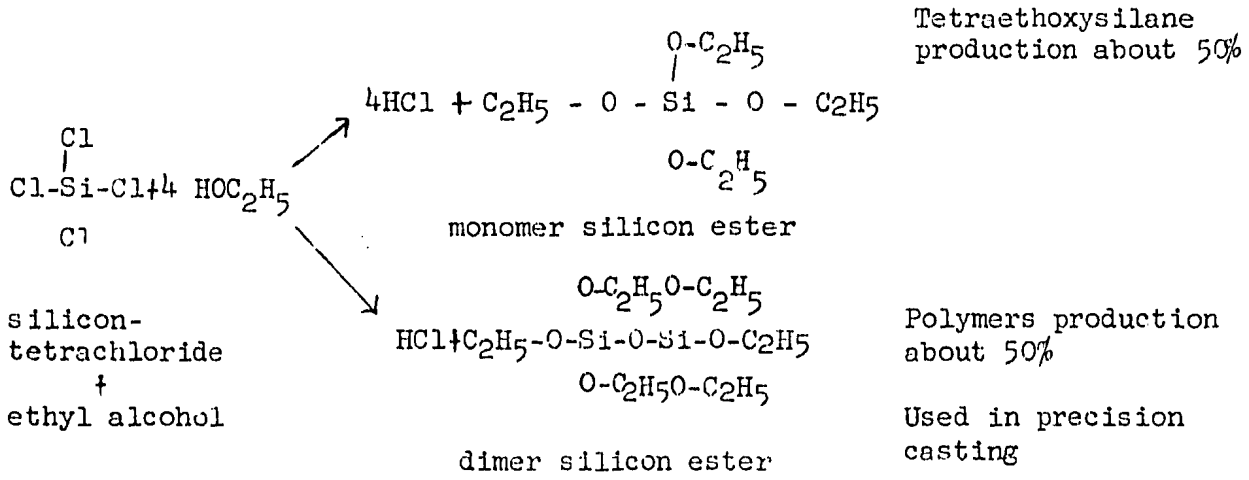
Whereas the bulk of this manual is based on Western sources and is very general in nature, this section deals with a procedure for Hungarian industrial production of silicone oils (for use in vacuum pumps) as developed at the inorganic chemistry school of the Budapest Technical University (Budapesti Muszaki Egyetem) by Prof Janos Proszt, assistant instructor Ivan Lipovecz, and postgraduate student Jozsef Nagy, on the basis of "earlier experiments by Soviet researchers" which are not further identified. Proszt and his two colleagues received the Kossuth Prize in 1953 for their work.

Actually, the text points out, the monomer silicon ester used to produce the silicone is a by-product of the industrial production of polymer silicon ester used in metallurgical molds to produce hard, smooth castings which are accurate to hundredths of a millimeter.

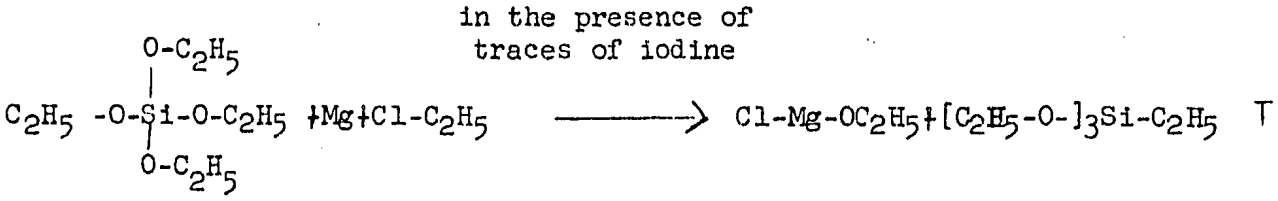
The text indicates that condensation (step "d" below) takes place in the presence of a metallic salt catalyst to guarantee the desired chain length. In the present case, about 70 percent of the silicone produced is of the desired chain length; only 30 percent is longer or shorter. The metallic salt used is not named. The text says also that for vacuum technology purposes the best chain length is about 8-10 or, schematically, $M\text{-}D_{6\text{-}8}\text{-}M$.

The synthesis is diagramed below:

a. Production of the Silicon Ester (Ethoxysilane)



b. Grignard-ation of the Silicon Esters



Tetraethoxysilane + magnesium + ethylchloride → ethoxymagnesiumchloride + triethoxy-ethylsilane

$$[C_2H_5O-]_4Si + 2\,Mg + 2\,Cl-C_2H_5 \longrightarrow 2\,Cl-Mg-OC_2H_5 + [C_2H_5-O-]_2Si[C_2H_5]_2$$

diethoxy - diethylsilane

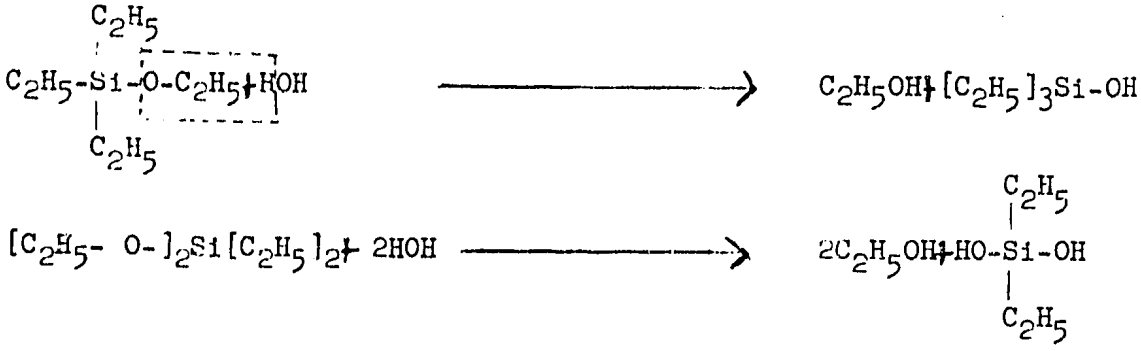
$$[C_2H_5-O-]_4Si + 3\,Mg + 3\,Cl-C_2H_5 \longrightarrow 3\,Cl-Mg-OC_2H_5 + [C_2H_5-O-]Si[-C_2H_5]_3$$

triethyl - ethoxysilane

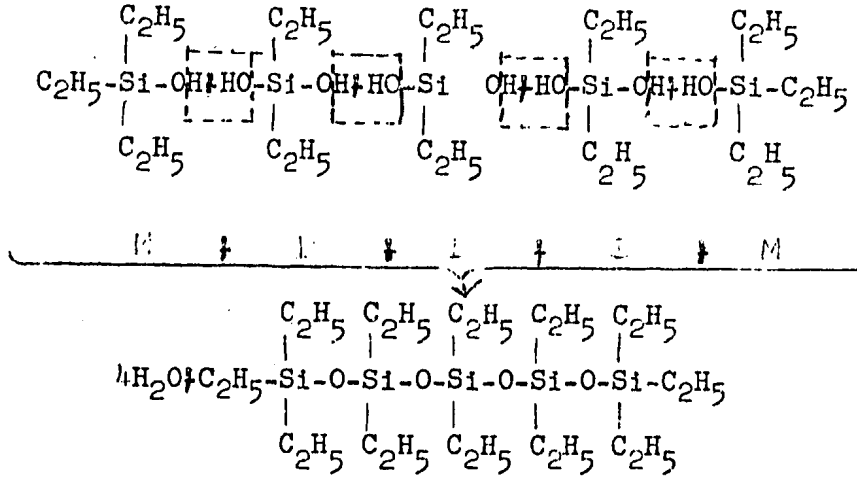
$$[C_2H_5-O-]_4Si + 4\,Mg + 4\,Cl-C_2H_5 \longrightarrow 4\,Cl-Mg-OC_2H_5 + Si\,[C_2H_5]_4$$

tetraethylsilane. However the tetraethylsilane does not form. Only the T, D, and M compounds form.

c. Hydrolysis of the Ethoxysilanes



d. Condensation Into Polysiloxanes



Water plus linear ethyl polysiloxane make up: $M\text{-}D_3\text{-}M$.

Inorganic Chemistry

16. Importance of Constitutional Diagrams in Investigation of Chemical Behavior

"The Work of N. S. Kurnakov and His Pupils on the Theory of Constitutional Diagrams and the Significance of These Diagrams for Inorganic Chemistry," by V. I. Mikheyeva, Institute of General and Inorganic Chemistry imeni N. S. Kurnakov, Academy of Sciences USSR: Moscow, Zhurnal Neorganicheskoy Khimii, Vol 3, No 3, Mar 58, pp 562-570

The importance of research on constitutional diagrams is discussed from the standpoint of the chemical behavior of elements and compounds not only as far as the formation of intermetallic compounds is concerned, but also under consideration of broader aspects involving stabilization, reactivity, and presence of free bonds in binary and ternary systems containing compounds between metals and nonmetals and forming complex compounds within these systems or reacting with liquid and gaseous substances. Particular emphasis is placed on metal hydrides and borides and their behavior and reactions. The formation of boron hydrides by the hydrolysis of metal borides is discussed with reference to the author's own investigations on the subject. The value of constitutional diagrams in work on boron hydrides is illustrated on the example of research pertaining to the effect of alloying aluminum with copper in the reaction of boron trichloride with hydrogen in the presence of aluminum (V. I. Mikheyeva and T. N. Dymova, Zhurnal Neorganicheskoy Khimii, Vol 2, 1957, p 3530)

Nuclear Chemistry and Technology

17. Importance of Data on Physical Characteristics of Salts in Connection With Work on Semiconductors and Nuclear Fuels

"On the Contemporary Status of the Theory of Salts," by Prof A. V. Nikolayev; Moscow, Khimicheskaya Nauka i Promyshlennost', Vol 2, No 6, Nov/Dec 57, pp 674-676

This article reviews industrial applications of naturally occurring salts, the crystal structure of salts and their physical characteristics, and the use of salts as solvents. In the section on the crystal structure of salts and their physical characteristics, the importance of data on the physical characteristics of salts from the standpoint of applications in the fields of nuclear energy and semiconductor technology is discussed as follows:

While crystalline salts on the whole have ionic lattices, the percentage of covalent bonds becomes substantial already in the laminar lattice of cadmium iodide and is very significant in sulfides, selenides, and tellurides. For this reason, semiconductor properties are exhibited by salts of the last-mentioned class. Salts of this class are being investigated intensively at present from this standpoint. Semiconductors of this type and also seignette-electrics including barium titanate are discussed in detail by A. F. Ioffe in Fizika Poluprovodnikov (The Physics of Semiconductors), Academy of Sciences USSR, Moscow-Leningrad, 1957.

In ionic lattices strong electrostatic forces keep the ions at the nodular points of the lattice. The action of these forces in purely ionic lattices results in relatively high melting points and boiling points of the salts in question. As the valency of the cation increases, a screening effect arises, the percentage of covalent bonds increases, and other effects develop which lead to low melting points and to volatility. The volatility of salts at low temperatures is becoming increasingly important in nuclear technology in connection with the separation of uranium isotopes by the diffusion of uranium hexafluoride or on a cyclotron with the use of UCl_5, the separation by the distillation method of uranium, plutonium, and fission products, the distillation of protoactinium pentachloride from irradiated thorium, etc. (cf. Khimiya Yadernogo Goryuchego [Chemistry of Nuclear Fuel], Reports by Foreign Scientists at the International Conference on Peaceful Uses of Nuclear Energy, Moscow, 1956). The iodide method of refining, in which the volatility of the iodide is of definite significance, is being applied to an increasing extent in metallurgy. In addition to having a low melting point and being volatile at low temperatures, salts with multivalent cations exhibit the important property of solubility in organic solvents, so that they can be extracted (cf. A. V. Nikolayev, Khimicheskaya Nauka i Promyshlennost', Vol 1, 1956, p 548).

In the last section of the article, i.e., that on the use of salts as solvents, work on the solubility of uranium salts in water at high pressures and temperatures is discussed on the basis of results published outside the USSR. The significance of this work from the standpoint of the operation of homogeneous nuclear reactors is pointed out. Also, it is mentioned that extraction with fused fluorides has been investigated as a method for the separation of plutonium and of fission elements from irradiated uranium.

In summarizing the contents of the article, the author re-emphasizes the importance of the use of fused salts as solvents and extracting media. He also stresses the importance of the production of single crystals of salts, pointing out that single crystals are now being used for a very important application, i.e., as sensitive elements of scintillation counters. Examples of this type of application are given in the text. The author furthermore states that lithium salts are used in neutron counters and sodium iodide activated with thallium in gamma-radiation counters; gamma-radiation counters of this type are 70-100 times more sensitive than Geiger-Mueller counters, reaching a sensitivity equal to that of beta-counters.

18. New Experimental Results in Investigation of Constitutional Diagrams of Metal Systems and Significance of Work in This Field

"Achievements and Prospects in the Field of the Investigation of Constitutional Diagrams of Metal Systems," by O. S. Ivanov, Institute of Metallurgy imeni A. A. Baykov, Academy of Sciences USSR; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 3, No 3, Mar 58, pp 585-600

This article reviews current work on constitutional diagrams, stressing the significance of various aspects of work in this field from the standpoint of practical applications in technology. On the example of the constitutional diagram of the system Na-K at ordinary and high pressures, the author illustrates the significance and applications of data obtained at high pressures. He points out that the diagram of the binary system Na-K is the only example of an investigation of this type regarding the effects of high pressures on metal systems and recommends that more work be done in this field. After discussing the constitutional diagram of the ternary system Fe-Ni-Al and the significance of the data involved for an understanding of the high coercivity of alloys intermediate in their composition between iron and the compound Ni Al, the author emphasizes the importance of establishing by means of constitutional diagrams the existence of liquid solutions, saying that the formation of such solutions is an indispensable condition for the preparation of alloys and in some cases is of importance as such, as for instance, in connection with the employment in nuclear reactors of metal coolants consisting of potassium and sodium or of bismuth and lead, the application of solutions of uranium, thorium, and plutonium in liquid bismuth as nuclear fuel, and the extraction of plutonium by means of molten magnesium. He mentions in connection with this that the constitutional diagrams of components which do not interact readily with each other, as for instance, magnesium and uranium, are being subjected to investigation at present: the very low mutual solubilities of uranium and magnesium have been determined with great thoroughness.

To illustrate the importance of data on the formation of solid solutions which are obtained from the study of constitutional diagrams, applications of iron-nickel, iron-silicon, nickel-copper, nickel-chromium, and iron-chromium-aluminum are discussed. On the basis of solid solutions of these metals, alloys with low coefficients of thermal expansion, a low modulus of elasticity, a high coefficient of magnetic permeability, high electric resistance, and superior characteristics as heat-resistant materials have been developed. The importance of the mutual solubility in the solid state at high temperatures in the systems Ti-Al, Ti-Cr, Zr-Nb, Zr-Sn, U-Zr, U-Nb, and U-Mo from the standpoint of new technological developments is discussed.

The thermodynamic treatment of constitutional diagrams, by means of which correlations are established between the interaction of the atoms of components and the equilibrium parameters including concentrations, the temperature, and pressure, is reviewed with reference to work done by B. Ya. Pines, who derived equations for two-phase and three-phase equilibria in

binary and ternary systems by considering configurational components of energy and entropy only. The value of the thermodynamic treatment is illustrated on a number of examples. On the basis of the electronic structure of atoms, correlations are established between the crystal structure of elements as a function of their position in the periodic system and the stabilization of specific crystallographic types of lattices in solid solutions consisting of these elements. The conclusion is drawn that experimental data which have been obtained by the investigation of constitutional diagrams of binary systems indicate that it is possible to establish general relationships pertaining to the dependence of the type of diagram on the chemical nature of the components forming the system.

As far as systems consisting of uranium and metals of the 3 d series are concerned, the following information is given:

"In systems consisting of uranium and metals of the 3 d series, one can clearly perceive the effect on the formation of chemical compounds of differences between components as far as the number of electrons in the incompletely filled levels of their atoms is concerned. Thus, Ti forms the compound U_2 Ti, which is stable only up to 900°. Vanadium and chromium do not form any compounds with uranium, whereas the compounds U_6 Mn and U Mu_2 are formed with manganese. In the system with Fe, the stability of compounds of this type increases, while in the system with Co another compound, namely, UCo appears. Finally, Ni forms at least five compounds with U. In the system with copper, because of the formation in this element of a $3d^{10}$ electron shell, there is only one compound, namely, UCu_5, which is unstable, and a region of immiscibility in the liquid state exists."

After stating that development of new alloys requires the investigation of constitutional diagrams, the author reviews in some detail present and past work on titanium alloys and cites USSR and Western reviews on the subject. He states that the results obtained in the investigation of titanium systems are still very inadequate.

This is followed by a statement to the effect that in the development of heat-resistant alloys investigation of the constitutional diagrams of systems containing chromium, niobium, molybdenum, tantalum, and tungsten is of great importance: at the last annual conference on heat-resistant alloys, the report of the Central Scientific Research Institute of Ferrous Metallurgy stated with reference to the development of chromium alloys that the selection of the composition of alloys of this type was based principally on data derived from constitutional diagrams.

With reference to metals of importance in nuclear energy, the following information is given:

"One of the most important metals in the new technology is niobium. Its specific resistance to creep (the creep strength divided by the specific weight) at 1,000° is very high, which indicates that niobium alloys are very promising as far as applications in the construction of aircraft are concerned. The low cross section of thermal neutron capture exhibited by niobium makes this metal a valuable construction material for the core of nuclear reactors. At present, the available data on systems containing niobium comprise information on 15 binary constitutional diagrams only. Research must be conducted on niobium systems containing the following materials of practical importance; Al, Cr, Mn, Fe, Co, Ni, and Re. These metals will presumably prove to be quite soluble in niobium.

"In connection with the development of nuclear energy technology, great interest is evinced toward research on constitutional diagrams of systems containing zirconium, thorium, uranium, and plutonium. For instance, American and British publications indicate in reviews of work on constitutional diagrams of uranium that systems containing uranium and thorium have been investigated actively since the first days of the existence of the Manhattan Engineering District. Data on constitutional diagrams of plutonium in systems containing beryllium, lead, vanadium, manganese, iron, nickel, and osmium were published by Soviet investigators. At present the uranium systems have been investigated most completely: complete information is available on the constitutional diagrams of 29 binary systems, while 28 additional binary systems and 6 ternary systems have been investigated in part. Some data are also available on systems containing thorium. Because of the large size of its atom, thorium forms a continuous series of solid solutions only with zirconium, cerium, and lanthanum; other metals show only a limited solubility in thorium. Carbon and possibly also nitrogen, on penetrating into the octahedral interstices of the cubic face-centered lattice of alpha-thorium, form the continuous series of solid solutions Th-ThC(ThN). Binary systems formed by zirconium with all elements of practical importance have been investigated. However, no data have been published on even a single zirconium ternary system. This substantially also applies to ternary systems based on Th, U, and Pu.

"Research on the constitutional diagrams of all metals used in the new technology, namely, titanium, chromium, germanium, zirconium, niobium, molybdenum, tantalum, tungsten, thorium, uranium, and plutonium must be expanded considerably."

The author states that in order to avoid duplication coordination of work in this field must be improved and more information made available on work done abroad.

After describing on the basis of USSR and non-USSR publications new experimental methods for the investigation of constitutional diagrams, the author concludes his paper by saying that tasks imposed by the development of the new technology require expansion of work on the development of new alloys and in connection with this also expansion of research on constitutional diagrams of

binary, ternary, and more complex systems containing titanium, chromium, niobium, molybdenum, tantalum, and tungsten (as far as work on refractory alloys is concerned); based on germanium and silicon (in connection with work on semiconductors); and containing zirconium, beryllium, uranium, and plutonium (in connection with the development of alloys used in nuclear power technology).

Organic Chemistry

19. Pharmacology of Aminazine and Mepazine Investigated

"The Effect of Aminazine and Mepazine on the Central Transmission of Stimuli in Certain Motor Reflexes," by N. A. Kruglov; Moscow, Farmakologiya i Toksikologiya, No 1, Jan/Feb 58, pp 34-36

An electrophysiological analysis of the central effect of aminazine (N-3-dimethyl-aminopropyl)-2-chlorophenothiazine) and mepasin (N-methyl-piperidyl-3-methylphenothiazine) was made. It was established that these preparations had no effect on the velocity of transmission of stimuli in monosynaptic and polysynaptic reflex arcs of the cat's spinal cord, as well as on the functional mobility of the spinal flexor center. Aminazine and mepazine exhibit a high depressine activity in relation to the tonic centers of the spinal cord. When administered in small doses these preparations block the transmission of stimuli in the cross extensor reflex in decerebrated cats. Morphine and urethane do not exhibit such predilection, since they actively depress the transmission of stimuli in the tonic centers, as well as in the polysynaptic reflex arcs of the spinal cord.

20. Research on Methylphosphine

"Iodine Derivatives of Methylphosphine," by V. A. Ginsburg and N. F. Privezentseva; Moscow, Zhurnal Obshchey Khimii, Vol 28, No 3, Mar 58, pp 736-739

The acid iodides CH_3PI_4 and $CH_3PI_2 \cdot HI$ were prepared by reacting HI with the acid chlorides of methylphosphonic and methylphosphonous acids. Phosphorus methyltriiodide was reduced with yellow phosphorus to produce methyl iodophosphine. Under the same conditions, phosphorus triiodide converts to tetraiodophosphine quantitatively.

21. Research on Dialkylphosphorous Acids

"Reactions of Dialkylphosphorous Acids With Aldehydes and Ketones. Esters of 1-Oxy-1-Acetoethylphosphonic and 2-Oxy-4-keto-2-amylphosphonic Acids," by V. S. Abramov, L. Sh. Belokon', and F. I. Makhmutova, Kazan' Chemicotechnological Institute; Moscow, Zhurnal Obshchey Khimii, Vol 28, No 3, Mar 58, pp 665-667

Dialkylphosphorous acids were shown to undergo condensation reactions with diacetyl and acetylacetone. The corresponding esters, condensation products in equimolecular quantities, were obtained. Ester of 1-oxy-1-acetoethylphosphonic acid are comparatively stable to heating (distillation) which is explained by the formation of a hydrogen bond of the 1-oxy group with the carbonyl oxygen. Esters of 2-oxy-2-keto-4-amylphosphonic acid are enolized to 30-40%.

Radiochemistry

22. Use of Radioactive Isotopes in Prospecting and Surveying

"Brief News Items (USSR)" (unsigned article), Atomnaya Energiya, Vol 4, No 2, Feb 58, pp 219-222

At the Mining and Geological Institute, Ural Affiliate of the Academy of Sciences USSR, a method of prospecting for coal deposits has been developed which is based on determination of the intensity of dispersed gamma radiation. Radioactive cobalt serves as a source of the gamma radiation. The application of this method on an extensive scale by the "Geofizuglegeologiya" (Geophysics and Coal Geology) Trust has made possible a transition to the highly productive and low-cost core drilling of coal strata.

The institute has also developed on an experimental scale and checked under production conditions a method for the determination of industrially utilizable concentrations of heavy metals (lead, mercury, tungsten, etc.) along the cross section of boreholes by using soft gamma radiation and employing Se^{75} as a source of this radation.

Safety Engineering

23. Acidproof Protective Clothing

"Acidproof Protective Clothing," by S. Cherkasov; Moscow, Nauka i Zhizn', No 1, Jan 58, pp 79

"It is very important for workers employed in chemical, metallurgical, and other industries which use acids of varying concentration to have special clothing which will adequately protect them from burns.

"Until now, coarse wool overcoat material has been used principally for this purpose. However, suits tailored from this material do not guarantee full protection from harmful products, since they are consumed rather quickly by vapors and direct contact with highly concentrated acids.

"The laboratory of individual protection of the All-Union Scientific Research Institute of Labor Protection, working jointly with the Central Scientific Research Institute of Wool, has developed a new material, ShKhV-30, which is stable to acids.

"ShKhV-30 consists of a mixture of coarse wool and synthetic perchlorovinyl fiber. Mass, production testing of clothing made from this material indicated that it adequately protects workers from acids and as a result their length of service is 1.5-2 times as great.

"Recently, another acid-repellent material from perchlorovinyl fiber treated with an organosilicon preparation, GMS-9, was developed by workers at the laboratory in cooperation with the Institute of Wool and the Scientific Research Institute of Plastics. Special clothing made from this material is hygienic, light in weight (almost from two fifths to half the weight of clothing made from coarse wool cloth), and wears longer than ShKhV-30."

Miscellaneous

24. English Contents List in Russian Abstract Journal

Referativnyy Zhurnal -- Khimiya, No 1, Jan 58

Beginning with Issue No 1, 1958, the chemical series of the Soviet Referativnyy Zhurnal has an English translation of the table of contents on the back cover.

III. EARTH SCIENCES

Geology

25. Mineral Resources of Central Kazakhstan

"Diversion of Irtysh River Water to Central Kazakhstan -- Deciding Factory for Complex Utilization of Its Mineral Wealth," by A. Ya. Zaplavnyy and V. A. Bessonov; Alma-Ata, Vestnik Akademii Nauk Kazakhskoy SSR, No 1, Jan 58, pp 13-24

The following passages are taken from the article:

"The magnitude of mineral concentration here can be judged from the fact that on the territory of the Turgay depression alone, the largest USSR deposit recently discovered and only partially explored already has been found to have a reserve of 12 billion tons of iron ore and large quantities of manganese. On the same territory were discovered tens of millions of tons of bauxite, as well as large deposits of lead and titanium.

"The major part of Central Kazakhstan iron, bauxite, and titanium ores outcrop at the surface and can be readily and cheaply mined by open-pit methods. Some of the iron ores do not require beneficiation and can be smelted directly.

"The huge iron ore reserves, which considerably exceed the reserves of the two major metallurgical bases of the USSR (the Southern and Ural) put together, are unusually favorably associated with the unlimited coal reserves of the Third All-Union "boiler-room" -- Karaganda (about 50 billion tons), Ekibastuz, Turgay (Kushmurun), Maykyuben, and other basins. The thickness of coal seams often reaches 80 to 100 m. About 18% of the Karaganda and Ekibastuz coals are of the coking grade.

"Central Kazakhstan, from the standpoint of the basic mineral resources which determine the level of development of the national economy and the defense capability of the nation, occupies the leading place among the productive regions of the Soviet Union.

"Here are concentrated more than 60% of the iron resources; about 50% of copper, molybdenum, tungsten, titanium; and also from 30 to 50% of the total resources of the USSR of coal, lead, zinc, bauxite, and other minerals.

"The main reason which prevented complete development of the industry in Central Kazakhstan is the lack of local water resources. The problem of supplying water from the Irtysh River is the most important one for development in all fields of national economy in Central Kazakhstan and the building here of the third metallurgical base of the USSR."

26. Second Republic Hydrogeological Conference

"Hydrogeological Conference" (unsigned article), Tashkent, Pravda Vostoka, 12 Feb 58

The Second Republic Hydrogeological Conference, convoked by the Institute of Geology, Academy of Sciences Uzbek SSR, and the Uzbek Hydrogeological Trust, was opened by Kh. M. Abdullayev, president of the Academy of Sciences Uzbek SSR.

Two separate reports on the results of hydrogeological and engineering-geological work for the past 40 years in the Uzbek SSR were given by Prof O. K. Lange, Honored Worker of Science Uzbek SSR and Kh. T. Tulyaganov, chief of the Main Administration of Geology and Mineral Conservation under the Council of Ministers Uzbek SSR. Other speakers included G. A. Mavlyanov, Corresponding Member of Academy of Sciences Uzbek SSR; N. A. Kenesarin, Candidate of Geologicomineralogical Sciences; G. D. Antonova, Uzbek Hydrogeological Trust; A. S. Khasanov, Institute of Geology, Academy of Sciences Uzbek SSR; M. T. Burak, Uzbek Hydrogeological Trust; B. A. Beder, Candidate of Geologicomineralogical Sciences, Uzbek Hydrogeological Trust; V. G. Gafurov, Candidate of Geologicomineralogical Sciences, Institute of Geology, Academy of Sciences Uzbek SSR; N. N. Khodzhibayev, Candidate of Geologicomineralogical Sciences; A. N. Sultankhodzhayev, Institute of Geology, Academy of Sciences Uzbek SSR; and V. M. Fomin, chief of the Hydrogeology Division, Ministry of Geology and Mineral Conservation USSR.

Geophysics

27. Improved Method of Calculating Potential Function of Mass

"Calculation of the Potential Function in the Lower Semiplane From Its Values Measured on the Earth's Surface," by S. V. Shalayev, Leningrad Mining Institute imeni G. V. Plekhanov; Moscow, Doklady Akademii Nauk SSSR, Vol 117, No 3, 1957, pp 403-406

It is proposed to improve the existing methods of calculating the potential function in a lower semiplane by a recalculation, not of the potential u itself, but of a certain function $\Phi(w)$ from a complex expression $w = u + iv$, where u and v are conjugate harmonic functions. The function $\Phi(w)$ is selected from such a calculation so that the complex function $\Phi[w(\tau)] = \Phi[w(x + iy)]$ is analytical in the field under consideration. A formula is derived which is suitable for the calculation. An example of the use of the proposed method in determining the depth of an iron quartzite deposit is given. Results agree favorably with findings produced by test borings.

28. Variations in Coefficient of Turbulence in Open Sea

"Variation of the Coefficient of Turbulence Based on Observations in the Black Sea," by V. V. Khlopov; Moscow, Izvestiya Akademii Nauk, Seriya Geofizicheskaya, No 2, Feb 58, pp 235-243

Coefficients of the vertical turbulence for the open part of the Black Sea and their variations with depth and time are determined.

On the basis of the observations on currents, a series of values for coefficients of horizontal turbulence is given. It is shown that the pulsating deviations of the components of current velocities from their average values are controlled by the law of normal distribution of random values.

29. Influence of Natural Barriers on Westerly Winds

"Influence of Large Orographic Barriers on the Westerlies," by G. P. Kurbatkin, Institute of Applied Geophysics, Academy of Sciences USSR; Moscow, Izvestiya Akademii Nauk, Seriya Geofizicheskaya, No 2, Feb 58, pp 244-254

The influence of orography on planetary atmospheric processes is considered. A method of solving this problem is proposed by which zonal currents are assigned functions of latitudes. A stationary linear problem on an "average level" with more precise boundary conditions is solved. Results of calculations for the Tibetan highland region are presented.

30. Seismic Waves in Plane Boundary of Separation of Two Media

"Reflected and Head Waves Arising in the Plane Boundary of Separation of Two Elastic Media, III," by N. V. Evolinskiy, Institute of the Physics of the Earth, Academy of Sciences USSR; Moscow, Izvestiya Akademii Nauk SSSR, Seriya Geofizicheskaya, No 2, Feb 58, pp 165-174

This is the third in a series of articles on reflected and head waves by the author. In articles I and II, reflected and head waves projecting on a background in a state of rest preceeding them was considered. These are the head waves PPP and PPS, and also the reflected waves PP and PS in regions up to the critical angle. Beyond the critical angle, the nature of the reflected waves is essentially changed. A similar change occurs in PSP and PSS waves according to a comparison with PPP and PPS waves, respectively. The current article deals with these.

Head waves, PSP and PSS, projecting on a preceeding background of PPP and PPS waves are investigated. Also studied are PP and PS waves in the field beyond the critical angle. Asymptotic formulas are obtained which are appropriate for the field near the front.

Miscellaneous

31. Section on Geodesy, Cartography, and Aerophotogeodesy Organized Under Scientific-Technical Council of Ministry of Higher Education USSR

"Chronicle" (unsigned article), Moscow, Geodeziya i Kartografiya, No 9, Sep 57, p 79

The Section on Geodesy, Cartography, and Aerophotogeodesy was organized in March 1957 in the Division of Technical Sciences of the Scientific-Technical Council, Ministry of Higher Education USSR. The aim of the section is to direct the thematics of scientific research on geodesy, cartography, and aerophotogeodesy in the higher educational institutions, and to coordinate this work.

The chairman of the section is Prof M. D. Solov'yev. Other officers include Prof A. I. Durnev, deputy chairman, and N. I. Yegorov, Candidate of Technical Sciences, scientific secretary. The membership includes A. N. Baranov, Lt Gen Tech Serv M. K. Kudryavtsev, and professors from the larger vuzes.

32. Institute of Economic Geology of Academy of Sciences USSR To Be Organized

"We Need an Institute of Economic Geology," by V. Samoylov, Candidate of Geologicomineralogical Sciences, Moscow, Promyshlenno-Ekonomicheskaya Gazeta, No 39, 30 Mar 58, p 3

At a general meeting of the Department of Geologicogeographical Sciences of the Academy of Sciences USSR, the Council for the Coordination of Scientific Activities of the Academies of Sciences of the Union Republics and Affiliates of the Academy of Sciences USSR, the Presidium of the Academy of Sciences USSR, the Ministry of Higher Education USSR, and the State Scientific-Technical Committee of the Council of Ministers USSR, a decision was reached on the organization of an Institute of Economic Geology (Institut Ekonomicheskoy Geologii), to be included within the system of the Academy of Sciences USSR.

One of the main aims of the institute will be to study problems concerned with the effective and complete utilization of the mineral and natural resources of the USSR. The institute will also form the scientific basis and methodology for economic evaluation of deposits of natural resources.

33. Geophysicists Meet in Hungary

Budapest, Termeszettudomanyi Kozlony, No 9, Nov 57, p 428

The Hungarian Society of Geophysicists held its Third International Conference from 26 to 28 September 1957.

Geophysical problems of the Carpathian basin were discussed at the conference. The speakers included D. Csomor, Z. Kiss, L. Bendefy, L. Stegena, O. C. Hilgenberg, V. Scheffer, T. Szalai, Gy. Szenas, M. Pecsi, and S. Molnar from Bratislava; R. Rosler, Kl. Schlosser, Kl. Rothe, and H. Bremer from Freiberg; and L. Constantinescu from Bucharest.

IV. ELECTRONICS

Communications

34. New Soviet Television Receiver

"Televisor Temp-3" (unsigned article), Moscow, Vestnik Svyazi, No 11, Nov 57, cover page

The television receiver "Temp-3" is designed for the reception of 12 TV channels in the frequency range from 48 to 230 Mc, and for FM-VHF reception in the range from 64.5 to 73 Mc. The size of the picture screen is 345 mm by 257 mm. Sensitivity for channels 1-5 is about 100 microvolts and for channels 6-12 about 200 microvolts.

The set has 18 tubes and a rectangular type 43LK2B picture tube. The power consumption is about 165 w for TV reception and 65 w for radio reception or sound recording. The over-all dimensions of the set are 494 X 430 X 450 mm, and it weighs 32 kg.

35. New Industrial Television Installations

"Industrial Television Installations," by L. S. Il'ina, Moscow, Informatsionnyy Listok VNII MRTP, 1957, No 4 (225), pp 3-8 (from Tekhnika Kino i Televideniya, No 2, Feb 58, p 91)

The article describes the development of four types of industrial television installations (PTU) and the series production of such equipment in 1957. The technical characteristics, the block diagrams, and photographs are included in the article. The PTU-0, PTU-1 and PTU-2 installations operate with vidicon camera tubes and the PTU-3 with a superorthicon tube.

36. Television and Radio Sound Systems

"Promising Acoustic Systems for TV and Radio Receivers," by D. Kh. Shifman, Moscow, Nauchno-Tekhnicheskiy Sbornik IRPA MRTP, 1957, vyp. IX, pp 20-28 (from Tekhnika Kino i Televideniya, No 2, Feb 58, p 92)

This article discusses sound systems of domestic and foreign receivers and the tendencies of their further development. Although the present systems employing the three-dimensional sound effect appreciably improve the sound reproduction, a further improvement can be obtained through the stereophonic effect. It is pointed out that the solution of such a problem involves great technical difficulties, and it is suggested that such a problem can be approached by the development of a pseudostereophonic system. Several variants of pseudostereophonic effects are discussed. Such pseudostereophonic effects can be obtained by proper placing of the loudspeakers.

37. Noise Suppression by Means of Converters With Resonant Characteristics

"The Suppression of Pulse Noises by Means of the Nonlinear Conversion of the Shape of Their Frequency Spectrum," by A. A. Gorbachyev, Moscow, Radiotekhnika, No 1, Jan 58, pp 56-61

The author examines various aspects of linear spectrum conversion. Experiments based on a method suggested by D. V. Ageyev are conducted on the suppression of pulse noises by means of two mutually inverse conversions of the spectrum and limiting of the amplitude.

Two receivers, the 'Baltika' and the 'Oktava,' were used with artificial pulse noises in the form of separate pulses with successive repetition rate up to several hundred per second.

"The results of the experiment show that the use of the two mutually inverse spectrum converters and a limiter results in a significantly greater effectiveness of pulse noise suppression than the use of an ordinary limiter. The first linear converter and limiter substantially convert the energy distribution curve of noise in the frequency band.

"The characteristics of the first converter must be such that:

"1. A greater ratio of noise level to signal output level is obtained at the limiter output.

"2. Limiting results in such a conversion of the form of the noise spectrum at which the second converter would bring about signal discrimination with the greatest effectiveness."

38. Field Strength Stability in Radio Relay Systems

"On the Stability of Field Strength in the Intervals of Radio Relay Transmission Line," by A. I. Kalinin, Moscow, Radiotekhnika, No 1, Jan 58, pp 22-28

An examination is made of field strength stability curves for radio relay systems according to known relationships between the attenuation factor and the vertical gradient of the permittivity of air and to the statistical distribution of the values of this gradient in the dispersal region of the given interval of the transmission line. Equations for optimum curves of field strength stability are given. Numerical results are given for climatic conditions of the middle belt of European territory of the USSR.

39. New USSR Television Receiver

"New Sets," by F. Tormozov, Moscow, Radio, No 3, Mar 58, p 19

The "Yenisey" TV receiver is a modification of the "Avangard-55" receiver and is equipped with a 35LK2B picture tube. The "Yenisey" receiver is designed for the reception of five TV channels and FM-VHF radio broadcasts. The set has 17 radio tubes, most of the miniature series. The sensitivity of the set for all the TV channels is about 300 microvolts/m. The vertical definition of the picture at the center is about 450 lines. The power consumption of the set is about 160 w. It is priced at 1,600 rubles.

40. New Soviet Radio Receiver

"New Sets," by F. Tormozov, Moscow, Radio, No 3, Mar 58, p 19

The "Minsk-58" radio receiver is manufactured at the Minsk Plant of the Belorussian Sovnarkhoz (Council of National Economy). The set is designed for reception of short-, medium- and long-wave AM and of FM-VHF radio broadcasting.

The receiver uses either an indoor or outdoor magnetic antenna for the reception of long- and medium-wave programs and a dipole antenna for the reception of FM-VHF programs. The wavelength ranges covered by the receiver are as follows: 4.11-4.65 m, 24.5-33.4 m, 39.0-54 m, 54-75 m, 187.5-577 m and 722.9-2,000 m.

The sensitivity of the receiver is about 150 microvolts/m for the outdoor antenna and about 10 microvolts/m for the indoor magnetic antenna. The power consumption of the set is 60 w and the output is 2 w. The overall dimensions of the set are 590 X 330 X 426 mm, and the price (radio-phonograph combination) is 1,400 rubles.

Electromagnetic Wave Propagation

41. Effect of Dielectric Film on Attenuation of H_{01} Waves in Waveguides

"The Influence of a Dielectric Film on Attenuation of H_{01} Waves in a Straight, Nearly Circular Waveguide," by B. Z. Katsenelenbaum, Institute of Radio Engineering and Electronics, Academy of Sciences USSR, Moscow, Radiotekhnika i Elektronika, No 1, Jan 58, pp 38-45

The article gives an account of the attenuation of H_{01} waves in circular waveguides having a slight deformation and no dislocation of axis, with the application of a thin semiconducting material to the waveguide surface.

An analysis is given of the effect of the semiconducting film in regular waveguides with nearly circular cross sections, and the results are then applied to an irregular straight waveguide.

The equations developed by the author may be used to determine the additional attenuation of H_{01} waves in various self-filtering waveguides.

42. Optimum Linear Cophased Antennas

"Optimum Linear Cophased Antennas With Continuous Current Distribution," by I. F. Sokolov and D. Ye. Bakman, Moscow, Radiotekhnika i Elektronika, No 1, Jan 58, pp 46-55

"The Dolph method for computing optimum linear cophased arrays, consisting of separate radiators, is expanded to apply to antennas having continuous current distribution along their length." The author develops and analyzes formulas for computing directivity patterns, peak current distribution curves, and utilization factory [the relation between directive gain of the test antenna and directive gain of an antenna with equal

peak distribution] curves. The latter curves show the relationship between the utilization factor of optimum antennas and their respective lengths, and the relationship between the utilization factor of optimum and quasi-optimum antennas and side-lobe levels.

"It is shown that at comparatively high side-lobe levels an increase in optimum antenna length leads to a rapid decrease in the utilization factor. At side-lobe levels on the order of 40 db and lower a change in length has increasingly less effect on the utilization factor. The utilization factor of quasi-optimum antennas may be considered independent of relative antenna length. With large antenna lengths and equal side-lobe levels, the utilization factor of quasi-optimum antennas exceeds that of optimum antennas."

The author concludes that antennas which are optimum from the viewpoint of side-lobe levels and width of directivity patterns are not optimum in relation to side-lobe levels and directive gain.

43. Symmetrical Apertures in Circular Waveguides

"Symmetrical Diaphragm of Arbitrary Thickness in A Circular Waveguide," by M. V. Bumrov, Moscow, Radiotekhniki i Elektronika, No 1, Jan 58, pp 56-60

The author applies the well-known Swinger's variational method for determining the effect of a circular diaphragm and aperture in a circular waveguide on the transmission of H_{01} waves. The case of thick partitions or diaphragms with circular apertures is described by a system of two integral equations relating to the electrical fields on each side of the diaphragm. In the example given, the dimensions of the waveguide are such that H_{01} waves are attenuated in the vicinity of the diaphragm.

"The system of integral equations is converted into two independent integral equations and then to a steady-state form. A quasi-statistical solution is used for comparison functions."

Formulas are given for computing the elements of the equivalent network for one particular case.

44. Performance and Characteristics of Relaxation Oscillators

"Relaxation Oscillators with Point-Contact Transistors," by V. N. Yakovlev, Moscow, Radiotekhnika i Elektronika, No 1, Jan 58, pp 61-73

This article is devoted to a study of oscillators with collector and emitter-collector capacitance, using a graphoanalytical method of computation.

Phase relationship diagrams are given for oscillators with emitter-collector and collector capacitance, and a study is made of their possible performance.

It is found that the reciprocal of the pulse duty factor (the relation of average pulse spacing to average pulse duration) for oscillators having emitter-collector capacitance may have a magnitude of 1,000-1,100, while that of oscillators with emitter capacitance is no greater than 125-150.

An oscillator having collector capacitance may be used as a saw-toothed voltage generator and as an integrating selector of pulses according to their duration.

The author discusses a relaxation oscillator with an inductance in the time base circuit which may be used for generating square-wave pulses or saw-toothed current.

"Expressions are derived for temporary pulse parameters, and the relation between the duration of pulse rise and parameters of the circuit and transistor is given."

45. New Stochastic Model for Theory of Signals

"On the Principle Problems of the Theory of Signals and Its Further Development on the Basis of a New Stochastic Model," by N. A. Zheleznov, Moscow, Radiotekhnika, Vol 12, No 1, Nov 57, pp 3-11

A critical analysis of the nature of the present theory of signals is given. The author shows that the limit conception of signals, a stationary process, does not include all types of radio signals. A new stochastic model is proposed with includes the principle characteristics of real signals.

The author states that "the present theory of signals, contradictory in its initial positions, regards signals as information carriers and at the same time gives them characteristics which preclude this possibility." Because of the limited applicability of the many contemporary theorems, the author concludes that for a new model "it is necessary to reject the assumption of a limited spectrum and the interpretation of signals as a stationary stochastic process.

"The proposed model of signals has the following characteristics:

"1. The signals are considered as being a nonstationary stochastic process.

"2. The duration of the signals (T) is finite.

"3. The energy spectrum is continuous and is nonzero in the frequency band (with the possible exception of a zero band).

"4. The interval of correlation τ_0 is limited so that $\tau_{c\,max.} \ll T$."

A number of problems dealing with the further development of the theory of signals are enumerated by the author. These include the introduction of rational spectral parameters for nonstationary signals, a study of the ergodic nature of nonstationary signals, etc.

Results of research performed by the author on the new stochastic model were presented, in part, in reports at the 12th Scientific and Technical Conference of the LKVVIA [Leningrad Red Banner Air Force Engineering Academy] imeni A. F. Mozhayskiy in January 1955 and at the All-Union Conference of the Theory of Probability and Its Applications in May 1955.

Laboratory Instruments and Equipment

46. High-Speed Oscilloscope

"High-Speed Oscilloscope SO-3," by Yu. N. Prozorovskiy, Institute of Radio Engineering and Electronics, Academy of Sciences USSR, Moscow, Pribory i Tekhnika Eksperimenta, No 5, Sep-Oct 57, pp 73-76

The high-speed cathode-ray tube used in the SO-3 oscilloscope was designed at the Scientific Research Institute of the Ministry of Radio Engineering Industry and is intended for observation of short radio pulses (3,000-4,000 Mc). The device can observe pulses of 10^{-7} to 10^{-9} second duration. The sweep speed can be varied from 2 X 10^{-9} sec/cm

to 50 X 10-9 sec/cm. The oscilloscope circuit comprises a synchrogenerator which controls its basic units and generates the trigger pulse for driving the investigated oscillator. The trigger pulses may either lead the start of scan by one microsecond or lag by 0.1 microcesond, thus permitting an observation of undistorted leading edge of the pulse.

The device consists of the following units: the master oscillator, the main delay line, the auxiliary delay line, the market switch, the generator of output pulses, the generator of calibration marks, the intensity-gate generator, the sweep generator, the power supply unit, and the traveling-wave cathode-ray tube.

The examined signal is fed directly to the deflection system of the cathode-ray tube and then is absorbed in a high-frequency coaxial load. The output impedance of the system is 75-100 ohms.

The SO-3 oscilloscope was developed at the Institute of Radio Engineering and Electronics, Academy of Sciences USSR. Two machines of this type were built.

47. Autodyne Detector in Magnetic-Resonance Studies

"On the Sensitivity of the Autodyne Method for the Observation of Magnetic Nuclear Resonance," by H. Weinhold, Jena; Berlin, Experimentelle Technik der Physik, No 6, 1957, pp 271-280

The sensitivity computed for the autodyne is half that of the bridge method. Since in the case of the autodyne the resonant circuit is part of a sensitive oscillatory network, there are additional unfavorable influences which are more difficult to avoid than in the case of passive networks. For this reason, the autodyne seems to be less well suited for areas of application in which maximum sensitivity is required; this is why autodyne detectors are not used in the more modern high-resolution equipment. If, however, a substance can be chosen which produces sufficiently strong signals, as is the case with the magnetometer, the autodyne becomes preferable because of its simplicity. Its easy variable tuning makes it especially suitable for spectrometry and the investigation of quadrupole resonances. For the latter purpose the autodyne method is also to be preferred because the balancing difficulties in the use of the bridge method (because of the relatively high resonant voltages) are not encountered.

The investigations described here were conducted as part of a thesis work in the Working Group for Nuclear Resonances, Physics Institute of the University of Jena.

48. Universal Measuring Instrument

"Universal Instrument for Measuring Current, Voltage, Power, Phase Shift, and Frequency," by A. Ye. Kaplyanskiy and P. N. Shevelev, Moscow, Izmeritel'naya Tekhnika, No 6, Nov-Dec 57, pp 68-70

The D-501 electrodynamic ampere-volt-wattmeter was developed at the "Tochelektropribor" (Precision Electric Instrument) plant under the direction of A. Ye. Kaplyanskiy.

The D-501 instrument is a ferrodynamic universal ac meter which permits the measurement of current, voltage, power, phase shift, and frequency.

The measuring ranges of the instrument are as follows: for the current, 2.5, 5, 25, and 50 a; for the voltage, 30, 75, 150, and 300 v; for the power, 75 w to 15 kw; for the power factor, from 0.5 to 1.0; and for the frequency, 350 to 450 c.

49. Photoelectric Photometer

"Spherical Photoelectric Photometer," by M. M. Gurvich and V. P. Lazarev, Moscow, Optiko-Mekhanicheskaya Promyshlennost', 1957, No 4, pp 32-33 (from Tekhnika Kino i Televedeniya, No 1, Jan 58, p 84)

The article describes the FM-41 spherical photometer, developed at the State Optical Institute, for the measurement of total light transmission coefficient of the optical systems. The photometer will measure the light transmission of the objects which either transmit or scatter the light; it is designed for testing flat objects 25-650 mm diameter and objects having a complex configuration (cup shape and others). The schematic diagram and constructional peculiarities of the device are given.

50. Series-Coupled Reflex Klystrons

"An Experimental Study of Mutually Synchronous Operation of X-Band Reflex Klystrons," by S. D. Gvozdover, A. I. Kostiyenko, and G. P. Lyubimov, Physics Faculty, Moscow State University imeni M. V. Lomonosova, Moscow, Radiotekhnika i Elektronika, No 1, Jan 58, pp 105-111

The article describes experiments performed with mutually synchronous reflex klystrons, coupled to a common load and having similar frequency characteristics. The electronic tuning range of such an arrangement may exceed the sum of the electronic tuning ranges of the individual klystrons.

The klystrons are fed by a common saw-toothed voltage and operate in succession, one after the other. No sudden changes in frequency or oscillation power occur.

With an increase in voltage on the reflector of one klystron, that klystron "catches" and "carries" the frequency of the klystron with less power. This general procedure is repeated in a two-klystron arrangement, whereas in a system of three or more mutually synchronous klystrons a special electronic commutator is needed.

A block diagram showing a system for studying the mutual synchronization of two reflex klystrons and a table giving the relationship between the synchronization band and the width of the electronic tuning range of the resultant band are given in the article. The table shows that an increase in the width of the electronic tuning range is accompanied by a decrease in the synchronization band and the average output power.

Three and five klystron arrangements are explained, and results of experiments with these systems are given.

51. Experiments With Mutually Synchronous Reflex Klystrons

"The Effect of a Load on the Mutually Synchronous Operation of Two Reflex Klystrons," by A. I. Kostiyenko and G. P. Lyubimov, the Chair of Radio Engineering, Physics Faculty, Moscow State University imeni M. V. Lomonosova, Moscow, Radiotekhnika i Elektronika, No 1, Jan 58, pp 112-115

The article describes a study made of the relationship between the width of the synchronization band and electronic tuning range and the impedance-frequency characteristics of a load in two mutually synchronous X-band reflex klystrons.

Reference is made to a previous article by the authors explaining the method of coupling two or more reflex klystrons for mutually synchronous operation (Radiotekhnika i Elektronika, No 1, Jan 58, pp 105-111).

A photograph of the system shows two identical reflex klystrons coupled to a common load which, in this case, is an oscillation indicator. Between the klystrons and the load is an impedance transformer with quarter-wave quartz prisms used to change the impedance-frequency characteristics of the load, and, thus, the "shape" of the frequency zone, the resultant electronic tuning range, and the width of the synchronization band.

It is seen that when the input impedance of the load is less dependent on the frequency the resultant electronic tuning range is significantly greater, as is the width of the synchronization band.

The author acknowledges the help of M. A. Drozdovoy and A. A. Lebed'.

52. Isochronous Traveling-Wave Tube

"Isochronous Traveling-Wave Tube," by G. F. Filimonov, Moscow, Radiotekhnika i Elektronika, No 1, Jan 58, pp 85-93

The article examines the problem of obtaining greater amplification and increased efficiency in traveling-wave tubes by artificially extending the stay period of electrons in the retarding field. It was found possible to increase the strength of the high-frequency field by 3 db.

The nonlinear expressions for a traveling-wave tube were examined by the author, and computations were performed on the BESM computer using the Runge-Kutta method of fourth order.

The results of the computations are given in graphs showing the change in non-dimensional power of the high-frequency field under various conditions, the process of formation of electron clusters (phase shifts of field and electrons), and others.

The author concludes that "the effect of isochronism is due to a change in the conditions of signal gain in the part of the tube where the signals are decreasing, at the time when maximum field strength is insensitive to relatively large changes in the direction of the curve in the vicinity of maximum field intensity."

The effect of losses on efficiency and conditions necessary to minimize such losses are discussed.

The author acknowledges the assistance of P. S. Mikazan, O. A. Merkulova, V. M. Khapayeva and L. A. Vaynshteyn.

53. Electron Conductivity in Magnetrons

"Experimental Study of Electron Conductivity of Space Charge Distribution in a Magnetron," by V. P. Tychinskiy, Moscow, Radiotekhnika i Elektronika, No 1, Jan 58, pp 116-130

A description is given of the methods and results of measurements of electron conductivity in magnetrons. Curves of "cyclotron" resonance of magnetrons are also provided. "An explanation is given for the irregularities of electron efficiency curves, due to space charge distribution of resonant layers."

The experimental results of electron conductivity are compared with statistical results obtained by the author in a previous article.

"The methods used for measurement of conductivity and its characteristics ('cyclotron' resonance and synchronism) is based on a study of the reaction of electrons to an externally applied signal."

A study is made of the behavior of input conductivity of the magnetron in relation to anode voltage for different magnetic fields.

It is found that "there exists a region of intense absorption along the line of cyclotron resonance and a negative conductance due to the appearance on the edge of the space charge cloud of a resonant layer.

"At high cathode temperatures the dynamic limit coincides (10-15%) with experimental results determined by the curve of 'cyclotron' resonance.

"It is shown that 'cyclotron' resonance in magnetrons may cause a decrease in electron efficiency under certain conditions depending on the order of acting harmonics."

The author acknowledges the assistance of N. Ya. Goncharov and Yu. T. Derkach.

54. Grounded-Grid Oscillators

"On the Computation of Oscillators With Ground Grids," by Ye. P. Korchagina and G. M. Utkin, Moscow, Radiotekhnika, No 11, Nov 57, pp 29-38

The problem of selecting an optimum system of amplifiers and frequency multipliers in a circuit with a grounded grid is examined. Several recommendations are given for choosing the cutoff angle and pulse amplitude of the plate current of the amplifier and frequency multiplier with a calculation of the amplification factor of the power stage.

For a limited magnitude of resonant circuit impedance, the author suggests a cutoff angle for the plate current of 90°. Decreasing this angle lowers the amplification factor of the power stage and increases the total power consumed by the plate circuits of the designed and preceding stages.

For a given load power the pulse amplitude of the plate current determines the efficiency of the circuit and substantially affects the energy relations in the plate circuit.

The author recommends for frequency multipliers in the intermediate stages a cutoff angle of 75° for cases where the frequency is doubled and 50° where the frequency is tripled.

In changing to systems having minimum plate voltages, an increase in power consumption and a decrease in the amplification factor of the power stage result.

Numerous curves are provided showing relations between anode current, anode voltage, cutoff angle, and efficiency.

55. Increased Output in Semiconductor Amplifiers

"Increasing the Net Output of a Resonant Semiconductor Amplifier by Means of an Increase in Its Efficiency," by L. S. Berman, Moscow, Radiotekhnika, No 11, Nov 57, pp 62-65

It is suggested that the net output of a resonant semiconductor amplifier may be increased to as much as twice the present output with the addition of an auxiliary circuit tuned to the third harmonic. The use of such a circuit in power tubes can increase the efficiency to 90% and can increase the net output an average of 30-40%, while the same circuit with semiconductor triodes may have a much greater effect.

The amplifier used by the author in his experiments was in a circuit with a grounded emitter and operated at a frequency of 106 kc. Five type P1E triodes were used. For an increased efficiency it was necessary that the coefficient of the third harmonic be negative, which meant operating at excess voltage.

The results given in tables show that the use of an auxiliary circuit permits an increase in efficiency from 75-76% to 87-88% and in net output from 159-155 mw to 300-320 mw.

"At high frequencies, the lag in the carrier current causes a pulse widening of the collector current and decreases the efficiency. To increase the efficiency, the cutoff angle was decreased by means of a cutoff bias at the input."

56. Pneumatic Detector for Microwave Range

"The Basic Principles of a Pneumatic Detector for the Microwave Range," by H. Jung and K. H. Gothe, Heinrich Hertz Institute; Berlin, Experimentelle Technik der Physik, No 6, 1957, pp 241-253

This article considers the feasibility of the use of an infrared detector in place of the crystal rectifier for the microwave range. An especially designed detector was built for 10 centimeters, a wavelength which is extremely unfavorable for a pneumatic detector but which is especially favorable for a comparison of measurements with theoretical data. The absorber consisted of a collodion base with evaporated gold as the absorbant material. The absorption properties were in good agreement with the theoretical values. Because of the noise from the ventilator for the stacked-disk tube of the dm-generator, measurements could not be made all the way down to the threshold of sensitivity; nevertheless a comparison with the theory could be made as follows: Theoretically, the technical sensitivity of the arrangement can be computed simply and defined as

$$E = \frac{\text{pressure change in the cell}}{\text{absorbed power per unit of surface}} .$$

Theoretically, for the chosen arrangement, the value

$$E_{th} = 3.7 \cdot 10^5 \frac{dyn}{W}$$

was obtained. This value was also satisfactorily verified through experiment. Since the theoretical limit for the pressure measurement for $A_M = A = 1\ cm^2$ and τ = one sec is approximately

$$\sqrt{\delta p^2_{min}} \approx 5 \cdot 10^{-5} \frac{dyn}{cm^2} ,$$

the threshold of sensitivity becomes approximately

$$N_{min} = \frac{\sqrt{\delta p^2}}{E} \approx 10^{-10} W.$$

This value has no practical significance for the large cell, since it is recomputed for an absorber area of only one square centimeter, but it shows the fundamental feasibility of the pneumatic detector, when properly designed, for the range in the vicinity of one-centimeter wavelength.

In spite of the considerable external noise (in the vicinity of the modulation frequency about $0.1/u_b$, which is 2,000 times more than the above-computed value for $\sqrt{\delta p^2_{min}}$), a power density of

$$N'_{min} = 3.4 \cdot 10^{-7} \frac{W}{cm^2}$$

could still be established experimentally for τ = one second. It is clear that the exclusion of external interferences is essential.

Further work is being done on an experimental variation of the Golay cell. The arrangements suggested by Boettcher (Experimentelle Technik der Physik, Sonderheft Spektroskopie, 1955, 83) and Weber (Optik, 6 [1950], 152-161) are not suitable for microwave techniques.

57. Two-Channel Electron Multiplier

"Two-Channel Electron Multiplier With Film Cathode," by A. I. Akishin, S. S. Vasil'ev, and T. N. Mikhaleva, Scientific Research Institute of Nuclear Physics, Moscow State University imeni M. V. Lomonosov, Moscow, Pribory i Tekhnika Eksperimenta, Sep-Oct 57, pp 36-38

Each channel of the electron multiplier consists of 15 stages and one anode. The electrodes of corresponding stages in both channels are connected electrically. A high negative potential is applied to the cathode and the ground potential to the anodes. The multiplier diodes are made of berillium-bronze sheets 0.2 mm thick and the anode of nickel sheet. The cathode of the multiplier is made of either thin metallic foil or metal coated organic film.

The effective area of the output area of the aperture is 35 by 8 mm. The ions falling on the cathode produce electron emission, thus forming voltage pulses at the anode of the first channel. If the ions have sufficient energy, they will also produce an electron emission from the back side of the cathode; in such a case a coincidence of voltage pulses occurs on both anodes, which is then registered by a coincidence circuit connected to the anode of the multiplier.

Such an electron multiplier can be used for registering the ions in the presence of an intense background of electromagnetic radiation. The energy level of the ions which can be registered by the multiplier is determined by the thickness of the cathode.

The effectiveness of this multiplier was checked with the aid of alphaparticles, protons (200 kev), and gamma rays.

58. East German Microwave Bridge for Study of Electron Resonance and Hyperfine Structure

"An Apparatus for the Investigation of Paramagnetic Electron Resonance in Crystals and Liquids," by E. Albold, B. Elschner, and P. Wenzel, Jena; Berlin, Experimentelle Technik der Physik, No 6, 1957, 254-261

A description, photograph, and measurement data are given for a microwave bridge for 3 centimeters wavelength, built at the Physics Institute of the University of Jena. After a careful adjustment of a "magic T" arrangement, an electron-resonance signal originating from 10^{-6}g of diphenyl-picryl-hydrazine ($\approx 10^{15}$ electron spin) was selected from the noise background even without a phase-sensitive rectifier. The use of the phase-sensitive rectifier with a time constant of $\tau = 8$ seconds increases the signal-to-noise ratio to about ten times the previous level.

Various hyperfine-structure cleavages could be established unequivocally. The apparatus is to be used in the future for the investigation of organic and inorganic compounds.

59. Measurements in Field of Electronics

"Metrological Institutes and State Control Laboratories of Measurement Technique for the Past 40 Years" (unsigned article), Moscow, Izmeritel'naya Tekhnika, No 6 Nov-Dec 57, pp 3-15

The All-Union Scientific Research Institute of Physicotechnical and Radio Engineering Measurements (VNIIFTRI), located in the vicinity of Kryukovo near Moscow, is the leading institute of the Committee for Measures and Measuring Instruments, Council of Ministers USSR, in the field of time, frequency, radio, acoustic, and hydro-acoustic measurements.

The institute comprises five scientific research laboratories conducting radio, time, frequency, acoustic, heat, and superhigh pressure measurements. The institute has the design bureau and the construction shops.

The radio measurement laboratory is housed in a specially constructed building and is equipped with modern instruments.

The principal aim of the laboratory is the development of precision methods of measurement and building of standard instruments for measuring the radio engineering values. The laboratory, in cooperation with other radio measuring laboratories of the committee's other institutes, has performed a series of experiments on measuring the power and attenuation at superhigh frequencies. The laboratory developed a number of standard

instruments for measuring current at superhigh frequency, which consisted of a hot-wire ammeter, a photoammeter, and an electrodynamic ammeter and permitted the testing of high-frequency (up to 100 Mc) ammeters in ranges up to 100 a.

Standard attenuators and devices for graduating such attenuators in the ranges of 10 cm, 3 cm, and 0.75-1.2 cm were developed.

The laboratory also developed a quartz resonator with the highest thus far known Q factor of 17 million and a molecular oscillator.

The laboratory is now aiming to develop a high-pressure gage for measurement of pressure up to 25,000 kg/cm^2.

Components

60. New Soviet Tape Recorder

"New Equipment," by F. Tormozov, Moscow, Radio, No 3, Mar 58, p 20

The "Melodiya" tape recorder is manufactured at one of the Novosibirsk plants. This tape recorder is designed for two-track recording at two tape speeds of 19.05 and 9.53 cm/sec. The capacity of each reel is 350 m. There is a provision for quick forward and backward rewinding of the tape. The rewinding of a tape from one reel to another requires 2-3 min. The recorder has two indicators: one is in operation during recording and the other is used to locate the required place on the tape. The power consumption is 100 w and the output at the amplifier is 2 w. The transmission-frequency characteristic is 50-10,000 c for the tape speed of 19.05 cm/sec and 100-6,000 c for the speed of 9.53 cm/sec. The weight is 24 kg and the price is 2,900 rubles.

61. Coated Pressed Cathodes

"A Pressed Cathode Based on Barium-Calcium Tungstate," by A. I. Mel'nikov, A. V. Morozov, B. N. Ponov, and A. A. Maklakov, Moscow, Radiotekhnika i Elektronika, No 3, Mar 58, pp 322-328

The authors enumerate a number of problems dealing with the technical preparation of pressed cathodes which have not yet been sufficiently examined. The results of preliminary experiments with thermionic cathodes and some of their properties are given.

The active materials used in the preparation of the cathodes consisted of $BaCO_3$ and WO_3. The mixture was pressed into tablets and baked at a temperature of 1,400 C. A barium tungstate compound was formed. To increase the emission properties of the cathode, $CaCO_3$ was added, forming barium-calcium tungstate ($Ba_2\ CaWO_6$). It was found that the latter substance had better emission properties than ordinary barium tungstate although its stability in air was less than barium tungstate.

A powderlike mixture of 9.5% barium-calcium tungstate, 90% tungsten, and 0.5% aluminum was pressed into cylindrical cathodes.

Curves are provided showing volt-ampere characteristics of diodes with pressed cathodes for different temperatures in static and pulse systems.

Other curves show cathode performance as a function of operating time, the effect of oxygen on emission, and the relationship between coefficient of secondary emission and energy of primary electrons for various temperatures.

"Results show that the coated pressed cathodes based on barium-calcium tungstate will emit current of significant density for considerable periods of time. The expediency of using such cathodes in electric vacuum devices with high current densities, particularly in superhigh frequency devices, is verified."

62. New Miniature Photomultiplier Tube

"A Miniature Photomultiplier With Solid Cathode," by A. G. Berkovskiy and L. G. Leyteyzen, Moscow, Radiotekhnika i Elektronika, No 3, Mar 58, pp 421-427

"The construction, parameters, and characteristics of a seven-stage miniature photomultiplier tube with lateral optical input are described. The box-shaped emitters and the cathode are of antimony-cesium. The gain of the multiplier at 900 volts is 10^4 to 10^5. Dark current at a sensitivity of 0.5 amp per lumen lies between 10^{-9} and 10^{-8} amp."

The over-all height of the tube not including pins is 58 mm, and the diameter is 22 mm.

The results of measuring the parameters of 20 sample tubes are given in tabular form, and typical volt-ampere characteristics of amplification and dark current are provided for the miniature photomultiplier.

Measurements were also made of threshold sensitivity using an electronic voltmeter to measure changes in signal and noise voltage. The results of these measurements are given for 20 phototubes.

The light characteristics of the photomultiplier, that is, the relationship between anode current and luminous flux, were examined and found linear for values of flux up to 10^{-4} lumens.

63. Video-Control Devices

"Small Video-Control Devices," by K. K. Runov, Moscow, Informatsionnyy Listok VNII MRTP, 1957, No 30, (209) pp 3-12 (from Tekhnika Kino i Televideniya, No 2, Feb 58, p 90)

The article reports on the development of a number of video-control devices. Of great interest are the small video-control devices which utilize 13-inch screen cathode-ray tubes. Most of these video-control devices have similar circuits and differ from each other only in some components.

These devices are made either in hermetically sealed (VKU-13G) or in unsealed (VKU-13) housings.

The article analyzes the circuits of the VKU-13 and the methods used for the maintenance of satisfactory resolution. The circuit diagrams and photographs of the VKU-13 are given.

Computers and Automation

64. Czechoslovak "SAPO" Computer to Go Into Service

"SAPO" Will Go Into Service" (unsigned article), Prague, Lidova Demokracie, 15 Mar 58, p 1

The Institute of Mathematical Machines (Ustav matematickych stroju) of the Czechoslovak Academy of Sciences, having set up the third unit of the machine, is preparing the entire "SAPO" (Samocinny pocitaci stroj, automatic calculating machine) computer for continuous operation. Although the computer is a relay-type machine, designing having been started some 7 years ago when Czechoslovakia had no suitable electron tubes or transistors, it operates just as rapidly as electronic-type computers with magnetic drum memory.

"SAPO" now computes simultaneously on all three units; therefore, the possibility of error is practically eliminated. If all three computations do not agree, the machine repeats the operation, and if this does not help, it shuts off automatically. It requires less detailed instructions than similar foreign machines. Instructions are submitted through punch cards.

"SAPO" will be used for scientific and technical computation in such fields as transportation, construction, and wage computation.

65. Soviet Computers

"Small Computers," by B. F. Semkov, Moscow, Vestnik Akademii Nauk SSSR, No 1, Jan 58, pp 60-64

The M-2 and M-3 small calculating machines were developed at the Laboratory of Controlling Machines and Systems of the Academy of Sciences USSR under the direction of I. S. Bruk. The M-2 occupies an area of 22 sq m and the M-3 machines only 3 sq m. It was possible to attain such dimensions by using the semiconductor elements (diodes) which replaced some of the electron tubes.

The M-2 has 1,600 tubes and 10,000 semiconductor diodes, and the M-3 has 770 tubes and about 4,000 diodes.

The arithmetic unit of the M-2 consists of four trigger registers. The machine can operate with a fixed or floating decimal point. Such a novel combination was accomplished for the first time and has fully justified itself. Addition with a fixed decimal point is performed in two steps in such a manner that the first step can be separated from the second. This latter feature is particularly important in division or comparison of numbers. Multiplication is performed as a series of additions and decimal shifts, and division as a series of subtractions and decimal shifts. The M-2 uses an electrostatic memory device with a memory capacity of 512 thirty-four-digit binary numbers. The information is retained in the form of a distributed static electric charge on the screen of the 13 LO-37 oscilloscope, which has proved its longevity. Regarding its speed (2,000 operations per sec) and accuracy of computation (up to 10 decimal places) the M-2 is comparable to such larger machines as the "Strela." A new memory device is now being developed for the M-2 machine, which will help to increase its operating speed.

The M-3 was built at the Scientific Research Institute of the Electrical Industry in 1956. The capabilities of the M-3 are somewhat lower than those of the M-2. The speed of operation of the M-3 with a magnetic drum is about 45 two-address operations per second, and the accuracy is up to 9 decimal points.

A calculating laboratory using the M-3 machines was established at the Scientific Research Institute of Electrical Industry under the direction of Prof A. G. Iosifyan.

66. Parasitic Contamination in Barrier-Grid Storage Tubes

"An Action Mechanism of Cathode-Ray Barrier-Grid Storage Tubes for Digital Computers," by N. L. Yasnopol'skiy and A. P. Alekseyeva, Moscow, Radiotekhnika i Elektronika, No 1, Jan 58, pp 143-154

The results of experiments concerning parasitic "contamination" of adjacent elements of a dielectric target by secondary electrons in the processes of recording, reading, and regeneration of signals in digital computers are given.

The model used by the authors in their study differs from the ordinary barrier-grid tube in that a conducting layer of slightly acidified aluminum is used on the dielectric surface of the target. In front of the target at a distance of 65 microns is a net of tungsten wire with spaces of 250 microns between wires. On the target are arranged a series of concentric conducting rings insulated from each other and a conducting disk in the center which are grounded through voltage regulators and galvanometers. The remaining part of the target is grounded directly. The center disk, located in the electron beam, records, reads, and regenerates unit bits; the first ring records unit and zero bit elements, and the outer ring records zero bits. The area between centers of the rings records unit and zero bits.

"Results showed that contamination in recording and regeneration was greatest when the potential of the element and the potential of the separating elements approached a balanced value, near the potential of the net. Contamination in the reading process is considerably less. The contamination increases with an increase in potential of the element on which zero bits are recorded.

"It was established that at a given signal output level there exists an optimum value for the capacity of the dielectric layer and for the beam current, and a corresponding maximum number of conversions. Transition to a system of unbalanced recording and regeneration will allow an increase in the number of conversions due to a decrease in contamination to a level of one fifth to one tenth of what it was.

"With a two-pole recording system it is possible at optimum zero recording pulse to increase the number of conversions by 2 1/2 times that of a single pole system."

Acknowledgement is given to D. V. Zernov, Corresponding Member of the Academy of Sciences USSR.

Magnetic, Dielectric, and Semiconductor Materials

67. Field Emission of Rhenium

"Field Emission of Rhenium," by M. I. Yelinson, V. A. Gor'kov, and G. F. Vasil'yev, Moscow, Radiotekhnika i Elektronika, No 3 Mar 58, pp 307-312

The stability of rhenium against ion bombardment is compared with that of tungsten, and the emission and absorption properties of rhenium emitters are examined. Emission patterns of rhenium and rhenium-plated tungsten emitters with corresponding hexagonal lattice structure are provided.

The authors describe the procedure for preparing pointed rhenium emitters and rhenium-plated tungsten emitters. An electrodeposition method is used in preparing the latter, with potassium perrhenate and sulfuric acid as the electrolyte and a platinum spiral as the anode.

A spherical Mueller projector is used in observing the emission patterns.

"Two characteristic stages of change in geometry of the test substances are noted during ion bombardment -- the formation and increase in time of the number of small irregularities, more or less equally distributed on the surface of the emitter, and then a separation of the individual centers of emission with high field concentration, which practically determine the emission current." These changes and their relation to voltage and current changes are shown in emission patterns and curves.

The authors conclude that, from the viewpoint of absorption properties and stability against ion bombardment, rhenium is more suitable than tungsten and "may therefore be recommended as a field emitter for several classes of electronic devices."

68. Secondary Emission of Nonmetallic Materials

"Concerning a Method for Studying Secondary Electron Emission of Nonmetallic Materials," by A. R. Shul'man, I. R. Zakirova, Yu. A. Morozov, and S. A. Fridrikhov, Moscow, Radiotekhnika i

 Elektronika, No 3, Mar 58, pp 329-338

"A description is given of a method and apparatus for studying the basic characteristics of secondary electron emission of nonmetallic substances. The suggested method permits the exclusion of the effect of tertiary electrons and makes it possible to directly observe and record the relationship of the field intensity of primary electrons and complete delay curves on the screen of an oscillograph."

A spherical glass device was used having a diameter of 145 mm, with sections for the target and electron gun. The target was in the shape of a circular flat box, 16 mm in diameter, within which was a spiral heater. The target leads were connnected with the amplifier input. A spherical molybdenum grid 125 mm in diameter was used to decrease the effect of tertiary electrons between the collector and the target.

A pulse stretcher which increased the pulse rise time to several hundred microseconds was used in the circuit for measuring secondary emission pulses.

Automatic recording of the signal from the amplifier output was accomplished by means of an oscillograph and a milliammeter-recording instrument. Complete delay curves are given for ground mica and nickel for various values of primary electron energy.

The author concludes that "this method makes it possible to shorten the time required for experimentation, increase the precision of reading, and reduce to a minimum the errors caused by instability of the circuit and the target and the tertiary electron current from the collector.

69. New Photoconducting Materials

"New Photo Layer for Television Camera Tubes With Photoconducting Target," by K. A. Yumatov and V. I. Perevodchikov, Moscow, Radiotekhnika i Elektronika, No 3, Mar 58, pp 415-420

A description of the properties of photoconductors of lead sulfide with a lead oxide base is given, and the possibility of their use for widening the sensitivity range of camera tubes in the infrared region of the spectrum is discussed.

A new method is suggested for preparing lead sulfide photoconductors having a resistivity of 10^{11} to 10^{12} ohm-centimeters with sufficiently high sensitivity.

In determining the light characteristics of this photoconducting material, it was seen that characteristics for samples with different resistivities were logarithmically linear for all levels of illumination from 0.1 to 1,000 luxes.

Spectral characteristics were examined on an infrared spectrometer IKS-11 with a prism of lithium fluoride, providing a wavelength of 0.54-5 microns. The maximum sensitivity of the photoconductors was found to lie in the limits of 0.6-0.9 micron, and the spectral sensitivity extended from 1.7 to 2.1 microns.

It was explained that by controlling the amounts of PbS and PbO in the processing stage it is possible to regulate the spectral sensitivity or to obtain materials not responsive to infrared and having high sensitivity in the visible portion of the spectrum.

Frequency characteristic curves within a range of 2-60 cps are provided. Measurements of attenuation and excitation time constants showed that for certain materials these constants were less than 0.1 second and, therefore, were suitable for use in low-inertia vidicons.

Volt-ampere characteristics were also taken for potential levels of $1\text{-}6 \cdot 10^4$ volts per centimeter. These characteristics for high-resistance photoconductors of PbS were linear at all potential levels.

The coefficient of secondary emission of the photoconductors tested at 300-400 electron volts was equal to 1.2-1.4.

Temperature characteristics were also considered by the authors.

70. Emission Characteristics of Some Hexaborides

"Emission Characteristics of the Hexaborides of Some Rare-Earth Metals," by G. A. Kudintseva and B. M. Tsarev, Moscow, Radiotekhnika i Elektronika, No 3, Mar 58, pp 428-429

The emission characteristics of the hexaborides of Ca, Sr, Ba, La, Ce, Th, and a mixture of rare-earth metals of the cerium group are examined. It is shown that LaB_6 and the hexaboride of the rare-earth metal mixture have the greater thermionic emission.

The work function and the constant "A" were determined by the Richardson method. The radiation coefficient was found to be near 0.7 for all samples.

A table shows the average results obtained and the work function for a number of cathodes. The maximum coefficient of secondary emission in all cases was observed at a primary electron energy of 400-600 volts.

The relationship of work function of the hexaborides and the atomic radius and density of the metals to their atomic number is shown in graph form.

71. Experiments With Titanate Ferrites

"Some Titanate Ferrites at Microwave Frequenices," by R. G. Mirimanov and L. G. Lomize, Moscow, Radiotekhnika i Elektronika, No 1, Jan 58, p 154

Experiments were conducted by the authors in an attempt to increase the specific inductive capacitance of magnesium-manganese ferrites by the addition of calcium titanate. Type "U-0" ferrite was used because of its low losses.

"The pressed samples were slowly heated to a temperature of 1,300-1,350° C with a subsequent 4-hour holding at that temperature and even cooling to room temperature. The specific inductive capacitance and magnetic inductivity were then determined by the resonator method."

"A graph is given showing the relation between the parameters of unmagnetized ferrites and percentage content of titanate. Another graph illustrates the magnetic properties of titanate ferrites. It is seen that in all titanate ferrites (to 80% titanate content) there are approximately identical degrees of rotation of the plane of polarization.

[For additional information on semiconductor materials, see Item No 17.]

Miscellaneous

72. Second All-Union Conference on Radioelectronics

"The Second All-Union Conference of the Ministry of Higher Education of the USSR on Radioelectronics," by Prof P. V. Golubkov and Sh. E. Tsimring, Izvestiya Vysshikh Uchebnykh Zavedeniy -- Radiotekhnika, No 1, Jan-Feb 58, pp 123-128

The Second All-Union Conference on Radioelectronics was held at the Saratov State University imeni N. G. Chernyshevskiy from 23 through 29 September 1957.

More than 150 reports were presented concerning the results of research conducted in the institutes of higher education, research institutes, and related organizations.

A number of articles dealt with electromagnetic wave propagation and various types of delay systems. Among these was an article by V. M. Dashenkov entitled "Dispersion Properties of Certain Stub-Delay Systems." A paper by V. I. Bespalov and E. Ya. Daume, "Propagation of Electromagnetic Waves in a Heterogeneous Helix," presented results which make it possible to estimate the tolerances in measurements of helices as used in traveling-wave tubes. Another article, by M. E. Averbukh, offered a theory for treating waves in a helical cylinder as heterogeneous transverse waves. "On the Measurement of Circuit Impedance in Quasi-Cylindrical Delay Systems," by A. V. Gaponov, concerned cold measurement of circuit impedance for a large class of delay systems. An article by V. P. Sazonov discussed the distribution of electric fields in a series of modified delay systems.

A report presented by N. D. Devyatkov, "Electronic Developments in UHF in the Soviet Union," describes a number of UHF devices recently developed by Soviet specialists.

"Electromagnetic Waves in a System of Variously Directed Electron Flow," by V. M. Lopukhin, explained the variations in direction of electron flow in multibeam electron tubes.

Among the articles on electrodynamics was a paper by E. V. Anisimov and V. D. Luchinin entitled "On the Problem of Design of Certain Wide-Band Matching Devices."

A report by V. N. Shevchik, L. Ya. Mayofis, and L. D. Pokrovskiy expands the theories of traveling-wave and backward-wave tubes to include situations when the use of heterogeneous systems necessitates computing the discrete nature of the interaction of electrons with a periodically localized high-frequency field.

Several articles were presented on experiments concerning the construction of new UHF devices for the generation and amplification of oscillations in the millimeter and submillimeter levels.

The basic aims of further research in radioelectronics were noted at the conference. In the fields of electronics and electrodynamics of superhigh frequencies these aims include the solution of complicated problems of electrodynamics, the theoretical and experimental study of delay systems, and the construction of new types of electrovacuum UHF devices.

Further research was also considered necessary in connection with the production of semiconductor devices with increased frequency ranges and temperature stability.

A number of recommendations were made to the Ministry of Higher Education concerning improvement of conditions for future research development in the higher institutes of learning in the field of radioelectronics.

The Third All-Union Conference on Radioelectronics will be held in Khar'kov in September 1959.

73. New Institute of Electronics and Automatics Opened in Tomsk

Moscow, Izvestiya, 18 Apr 58

A new Scientific Research Institute of Electronics and Automatics (Nauchno-Issledovatel'skiy Institut Elektroniki i Avtomatiki) has been established at the Tomsk Polytechnic Institute. No further information is given.

V. ENGINEERING

74. Improvement of Range of Ram-Jet Vehicles

"On the Problem of the Maximum Range of a Vehicle With Supersonic Ram-Jet Engine," by Ye. V. Tarasov, Chair AD-1 (of Aircraft Egnines-1), Moscow Aviation Institute; Kazan', Izvestiya Vysshikh Uchebnykh Zavedeniy, Seriya Aviatsionnaya Tekhnika, No 1, 1958, pp 53-60

The article proposes a method of calculating the trajectory, variations of thrust, and fuel consumption during the powered flight of a vehicle with a ram-jet engine, which can deliver a pay load at a maximum distance with a given initial weight of the rocket, with a complete supply of fuel and other takeoff values.

The dependence of thrust and coefficient of external drag on the velocity and altitude of flight in a real atmosphere is taken into account; in the case of supersonic velocity, the compressibility of the air is also taken into account.

The proposed method affords the possibility of calculating the moment of engine cutoff, the fuel requirement, the rate of fuel supply to the combustion chamber, and other initial parameters, whereby flight to a maximum range with a given pay load and dead weight of the vehicle is guaranteed, if the relationship between the angle of incidence of the trajectory and the "local" horizon and the velocity and altitude at the beginning of unpowered flight are given.

With the total air excess ratio taken as a control parameter, it is possible to calculate, for a ram-jet engine with a given type of vehicle, a law of control, which is required if an improvement of range is to be realized.

75. Latest Superspeed Motion-Picture Camera Exhibited

"500,000 Frames per Second," by M. Dimov, Leningrad; Moscow, Nauka i Zhizn', No 2, Feb 58, p 45

One of the newest superspeed motion-picture cameras, capable of taking up to 200,000 frames per second, was described by Docent Ivanovich Kryzhanovskiy of the Leningrad Institute of Precision Mechanics and Optics.

This multipurpose camera has a speed range of 1,000-200,000 frames per second. The size of the frames can be varied. Photographing can be accomplished with or without supplementary lighting.

The camera is tripod-mounted and has a 360-degree turning radius. It is equipped with remote controls and a special instrument for synchronizing the start of the photographing with the moment of the start of the process being photographed. Synchronization can be produced by a control panel, and also by means of the process itself initiating the photographing.

Film loading can be done in daylight. The size and weight of the camera are such that it can be used in the field.

The first model produced achieved a speed of 200,000 frames per second. Another camera design was developed in the same institute which will reach a speed of 500,000 frames per second.

The newest apparatus for high-speed photography and motion pictures was recently installed in a Leningrad motion-picture theater. This exhibition was timed to coincide with a conference called by the Department of Chemical Sciences of the Academy of Sciences USSR.

Displayed at the exhibition in addition to the cameras described above was a model for testing the optics of superspeed motion-picture cameras. This model was designed by Engr L. A. Samurov of the Optical Institute imeni S. Vavilov. It was proposed that the system developed would permit increasing photographing speed up to 10 million frames per second.

76. New Scientific Research and Planning Institute of Machine Building Opened in Stalingrad

"In the Sovnarkhozes of the Russian Federation" (unsigned article), Moscow, Sovetskaya Rossiya, No 5, 7 Jan 58, p 2

A new Scientific Research and Planning Institute of Machine Building (Nauchno-Issledovatel'skiy i Proyektnyy Institut Mashinostroyeniya) has been opened in Stalingrad. The institute is subordinate to the Stalingrad Sovnarkhoz (Council of National Economy). Its duties will be to conduct research in automation and mechanization of production processes, the design of machines and shops, and improvement of the technology of production.

77. A. V. Vinter, Soviet Power Engineer, Dies

"Aleksandr Vasil'yevich Vinter" (unsigned article), Moscow, Promyshlenno-Ekonomicheskaya Gazeta, 12 Mar 58, p 4

Academician Aleksandr Vasil'yevich Vinter, outstanding Soviet power engineer and one of the originators of the Commission for the Development of the Lenin Plan for the Electrification of the USSR, died on 9 March 1958 at the age of 79.

In 1927 Vinter was named chief engineer of the construction of the Dnepr Hydroelectric Power Station and later named chief of the construction. During the 1930s he was Deputy People's Commissar for Heavy Industry, and before his death was the head of the Technical Council of the Ministry of Electric Power Stations. His awards include three Orders of Lenin and the Order of the Labor Red Banner.

78. Yugoslav Shipbuilding Specialist Dies

"Obituary of Engr Adam Armanda" (unsigned article), Zagreb, Vjesnik, 3 Mar 58, p 6

Prof Engr Adam Armanda of the Engineering and Shipbuilding Faculty (Strojarsko-brodogradjevni facultet) in Zagreb died on 1 March 1958. He was 60 years old.

VI. MATHEMATICS

79. Use of Method of Moments for Studying Oscillations in Linear Systems

"The Method of Moments for the Problem Concerning Oscillations of Linear Systems," by Yu. V. Vorob'yev, Moscow, Vychislitel'naya Matematika, No 1, 1957, pp 23-33

"The theory of oscillations for linear systems is sufficiently well developed at present and is being successfully employed for the solution of various electrical and mechanical problems. The motion of these systems is described by ordinary differential equations with constant coefficients. It has found especially wide application in the theory of servomechanisms and in systems of automatic control. Investigation of each oscillation system (if it is not clear beforehand that the system must function as a self-oscillation system) is generally begun with consideration of a linear problem.

"But in this case difficulties are encountered at the beginning. For theoretical analysis the real system is replaced by an ideal system in which the motion is subsequently studied. The more exactly the ideal system reflects the processes occurring in the real system, the greater, as a rule, the order of the system of differential equations describing its motion. In this manner the desire to possibly describe the motion of the system more exactly naturally leads to the mathematical problem of investigation and solution of a system of high-order differential equations. In problems of this type classical methods built on an algebraic basis become ineffective, and approximating methods are sought.

"In the present work we will consider two closely related problems: (a) integration of a system of high-order ordinary linear differential equations with constant coefficients when algebraic methods are ineffective and (b) lowering the order of a system of differential equations, more accurately, the approximate substitution of the original system by a system close to it, but of a lower order. By a 'close' system we shall understand a system where, on identical perturbations, the solutions are close to the solutions of the original.

"At first glance the second problem does not have any meaning. A system of the n-th order has n characteristic oscillations, each of which can be excited on an appropriate selection of an exterior influence on the system. On lowering the order of the system not only do the characteristic oscillations alter but also the number of them decreases and some of them drop from consideration in this manner. From this it follows that if the exterior perturbations are selected in this manner and the rejected characteristic oscillations are excited, then the process in the 'close' system will greatly differ from the process in the original.

"Nevertheless, in real systems the exterior perturbations are far from arbitrary. Generally, one or several of the elements of the system are subjected to the perturbations; the remaining move only in consequence of their connection with neighboring elements. Under these conditions some of the characteristic oscillations of the system may either not build up or build up only very slightly and do not indicate noticeable influence on the oscillations of the process. So stated, the problem concerning reduction of the order of the system of differential equations has meaning and is very real inasmuch as the order of the system of equations is determined not by the essence of the physical problem but by that degree of idealization which we introduced.

"Our present work is devoted to the investigation of the possibility of utilizing the method of moments for the solution of the problems stated."

Fundamentals of the method of moments are presented in the following works.

1. Yu. V. Vorob'yev, "Orthogonal Polynomial Operators and Approximating Methods for Determining the Spectrum of Linear Bounded Operators," Uspekhi Matematicheskikh Nauk, 9, No 1 (59), 1954.

2. Yu. V. Vorob'yev, "Application of Orthogonal Polynomial Operators for the Solution of Nonhomogeneous Linear Equations" (in printing).

3. Yu. V. Vorob'yev, "Method of Moments for "Non-Self-Conjugate Linear Operators and Acceleration of the Convergence of Linear Iteration Processes" (in printing).

4. A. N. Krylov, "Concerning Numerical Solution of Equations by Which the Frequency of Oscillations of Material Systems Are Determined," Izv. AN SSSR, seriya fiz. mat., pp 491-539, 1931.

VII. MEDICINE

Bacteriology

80. Use of Brucellar Bacteriophage

"Brucellar Bacteriophage and Prospects for Its Use," by M. S. Drozhevkina, Rostov-na-Donu Scientific Research Antiplague Institute; Moscow, Zhurnal Mikrobiologii, Epidemiologii, i Immunobiologii, Vol 28, No 9, Sep 57, pp 3-7

This article presents the results of research performed for the purpose of isolating a pure race of brucellar bacteriophage and studying it in detail. Earlier attempts by other investigators to isolate this bacteriophage and to reinforce its replication are referenced. It is mentioned that a stable laboratory race was obtained by Drozhevkina in 1951; the phage has been more recently isolated (1957) from the blood of brucellosis patients and from aborted animal fetuses. Races isolated from patients and animals were found to be weaker and less active than those obtained from standard strains of Brucella; essential differences in lytic action has also been observed.

By the experiments described, the author sought to explain the relationship of forms and dimensions of sterile patches produced by brucellar bacteriophage to the strain of Brucella on which the phage acted and to the composition of the culture medium, its consistency, and the thickness of the agar layer. The possibilities of using this method in addition to other accepted methods for typing phage were examined.

It is reported that antiphage mo[illegible]era was prepared in 1951 by immunizing rabbits; the action of these se[illegible] on different races of bacteriophage is presented in a table. Pure races of phage were observed to replicate giving rise to secondary cultures after complete lysis of the initial culture; a second table shows results of testing the sensitivity of secondary cultures to different races of phage.

Evidence is offered to support the existence of different types within phage races. The Asheshov method is recommended for study of phage-sensitive secondary cultures which differ from initial cultures in susceptibility to different races of phage.

As a result of intensive study of the large collection of brucellar bacteriophage at the author's disposal, the presence of Vi- and O-phages in Brucella was established. The basic properties, characteristics, and action of these phages are discussed in detail.

The presence of latent bacteriophage in Brucella cultures was investigated. Twenty-four strains of Br. melitensis and four strains of Br. abortus (all free from bacteriophage) from the Museum of Live Cultures of the above-mentioned institute were employed in these tests. The morphology of the cultures was altered by irradiation with ultraviolet rays; a high percentage of the cultures subjected to this treatment were found to contain latent bacteriophage.

Lytic and symbiotic forms of brucellar bacteriophage are discussed. In the process of investigating possible practical uses of phage, a new diagnostic preparation, polyvalent brucellar bacteriophage containing both Vi- and O-phage, was employed. A large number of "atypical" strains (59 and 168) were identified in cultures obtained from aborted lambs and blood from human patients. It was possible to determine the brucellar nature of these cultures within one day by the bacteriophage method. Polyvalent diagnostic serum is recommended for widespread use by antibrucellosis laboratories for rapid identification of Brucella.

On the basis of the tests with antiphage serum obtained from rabbits, this serum is also recommended for use by medical and veterinary bacteriological laboratories. Diagnostic Vi-serum and Vi-phage are considered to be especially valuable in cases in which the presence of Vi-antigen in cultures makes their identification difficult.

Possible therapeutic value of brucellar bacteriophage was also considered in connection with these experiments. Phage was isolated from almost all portions of blood taken from patients, but differed in strength and titer. A definite correlation between increase in bacteriophage titer and improvement of the patient's conditions was noted. Results of phage therapy of experimental brucellosis revealed that significant changes occur in the animal organism due to the effect of bacteriophage. The introduction of bacteriophage into guinea pigs and rabbits with brucellosis resulted in deallergization of the animals, more rapid increase in agglutination titers, increase in the physiological reactivity of the organism, and acceleration of the disappearance of the pathogen. The author considers further investigation of brucellosis therapy with specific bacteriophage promising.

It was concluded as a result of 7 years' study of brucellar bacteriophage that a stable laboratory race of this organism had been obtained; that the use of specific bacteriophage at a given stage of brucellosis facilitated diagnosis; and that phage had prospects as one component of brucellosis therapy.

81. Comparative Chemical Composition of Virulent and Avirulent Plague Strains

"The Problem of a Comparative Study of the Chemical Composition of Virulent and Avirulent Strains of the Plague Microbe," by V. G. Akimenko and Ye. N. Aleshina, Tr. Rostovsk.-n/D. gos. n.-i. protivochumn. in-ta. (Works of the Rostov-na-Donu State Scientific Research Antiplague Institute), 1956, No 10, pp 90-95 (from Referativnyy Zhurnal -- Biologiya, No 23, 10 Dec 57, Abstract No 96858, by A. S. Shevelev)

"The chemical composition of 2-day cultures of a virulent strain of Pasteurella pestis and the EV vaccine strain were investigated. Both strains were grown on nutrient medium of the same [production] series. The presence of amino nitrogen was detected in both strains. Total nitrogen amounted to 11.7% in the virulent strains and 11.28% in the avirulent strain. Biuret and xanthoproteic tests and tests for tyrosine, tryptophan, tryptophan with glyoxylic acid, arginine, and histidine were positive with the hydrolyzates of both strains. Tests for free phosphorous were definitely positive with the hydrolyzates of the virulent and vaccine strains; however, in the latter, the tests were brighter; 0.62% phosphorous was present in the virulent strain and 1.13% in the avirulent. More hydrocarbons (6.33%) were found in the virulent strain than in the avirulent (5.3%). Lipoids constituted 6.07% of the former and 6.75% of the latter. Total quantity of inorganic substances constituted 6.42% of the virulent strain and 6.60% of the avirulent strain."

82. Improvement of Differentiation Between B. pseudotuberculosis rodentium Pfeifferi and Past. pestis

"The Problem of the Improvement of the Differential Diagnosis Between Past. pestis and B. pseudotuberculosis rodentium Pfeifferi," by M. S. Pylenko, Tr. Rostovsk.-na-D. gos.n.-i. protivochym. in-ta. (Works of the Rostov-na-Donu State Scientific Research Antiplague Institute), 1956, No 11, pp 39-48; (from Referativnyy Zhurnal -- Biologiya, No 23, 10 Dec 57, Abstract No 96859, by M. Ya. Boyarskaya)

"The speediest and most convenient method of differentially diagnosing the plague and pseudotuberculosis pathogens is a test for bacteriophage specificity. In view of the shortcomings of this specificity test, methods were investigated for improving it. All the tests were conducted on 3% Martin's agar. The test cultures were grown directly on bouillon at 18-20 degrees and then loop transferred to the agar surface by carefully spreading over an area of $2cm^2$. After drying this loop culture, the bacteriophage was selected and carefully applied to the center of a sown

area. The culture was then placed in a thermostat at 18-20, 28, and 37°. The lysis of a culture by the pseudotuberculosis as well as the plague phage is significantly slower on a solid medium than on a liquid medium. Plague cultures can be lysed only by an undiluted pseudotuberculosis phage, but a pseudotuberculosis culture can be lysed in a dilution of 10^3. Tests with the plague bacteriophage can be conducted at room temperature (18-20°) with good results after one or 2 days. For a tentative determination of the nature of microbes, the pseudotuberculosis bacteriophage can be used not only full-strength but also in the diluted state at 18-20 and 30°."

83. Chinese Find Complement-Fixation Test Better Than Other Plague Detection Methods

"Complement Fixation Tests for the Detection of Plague Infected Rats," by Lu P'in-chang (陸 品 章), Ts'ai Chu-ch'in (蔡 珠 欽), Liu Jen-han (劉 仁 漢), and Weng Wen-yuan (翁 文 淵), Fukien Plague Prevention Center; Peiping, Wei-sheng-wu Hsueh-pao (Acta Microbiologica Sinica), Vol 5, No 4, Nov 57, pp 451-454

This item describes a complement-fixation test, using a specific and absorbed plague antiserum, by which the authors successfully detected the plague antigen in the tissues of decomposed rats after the artificially infected animals had been dead for as long as 20 days. The rate of detection by this method was 100 percent, as compared with 84.8, 39.3, and 15.1 percent by Ascoli's test, blood-gentian-agar cultivation, and animal inoculation methods (cutaneous, intra- and subcutaneous), respectively. The antiserum used in the complement-fixation tests was prepared by the authors, had a titer of 1:1,280, had undergone agglutinin absorption by Bacillus pseudotuberculosis, B. typhi murium, B. coli, B. paratyphi, and transformed bacilli; and contained a preservative of mercury thiosalicylate.

The authors briefly review reports of earlier attempts by Western and Soviet scientists to employ the complement-fixation test in the detection of human and murine plague infection and note that their methods have been of no value in diagnosis.

84. Accelerated Bacterial Methods of Diagnosing Tularemia

"Methods for Speeding Up the Bacterial Diagnosis of Tularemia," by M. S. Drozhevkina and T. I. Puchkova, Tr. Rostovsk.-n/D. gos. protivochumn. in-ta. (Works of the Rostov-na-Donu State Antiplague Institute), 1956, No 10, pp 167-186, (from Referativnyy Zhurnal -- Biologiya, No 23, 10 Dec 57, Abstract No 96872, by A. S. Shevelev)

"A method of speeding up the bacterial diagnosis of tularemia is based on the killing of infected animals soon after infection followed by bacterial investigation of the organs. Positive culture results have been obtained within several hours after infection of mice and guinea pigs. Best results were obtained by culturing on a liquid egg yolk medium. By conducting the bio-tests on wild rodents, cultures of the pathogen from animals which died from tularemia could be isolated 5-6 days earlier. In addition, after the infection of white mice with ten microbe bodies, the pathogen was isolated from the site of infection within 6 hours, within 12 hours from the regional lymph nodes, and within 3 hours from the spleen and liver. In guinea pigs, infected with 100 microbe bodies, tularemia bacteria were isolated within 1-2 hours after infection. Such an early bacterial diagnosis can be utilized even in large-scale bio-testing. A method was also proposed for investigating the punctate from the site of administration and from the regional lymph nodes. With this method, a small amount of the liquid is taken into the syringe -- it is recommended that a small amount of egg yolk medium be taken in through the syringe needle to begin with -- after which a culture is made on a solid or liquid medium. In a number of animals, the tularemia bacteria can be isolated within 24 hours; the best culture from the punctate material can be obtained 2-3 days after the administration of the bacteria; however, best results from a punctate of the regional lymph nodes take a little longer. The best results, which give a 100% guarantee of isolating a culture, are obtained by a simultaneous collection of material from a puncture of the administration site and the regional lymph nodes."

85. Properties of Pseudotuberculosis Bacteriophage

"Pseudotuberculosis Bacteriophage and Its Properties," by R. I. Kontlyarova, Works of the Caucasian and Trans-Caucasian Scientific Research Antiplague Institute, 1956, Issue No 1, pp 234-241 (from Referativnyy Zhurnal -- Biologiya, No 23, 10 Dec 57, Abstract No 96639, by Ya. I. Rautenshteyn)

"After sowing a 9-day culture of Bacillus pseudotuberculosis rodentium No 8 in Martin's bouillon on agar media, a noticeable number of abnormal colonies (hyalin-gray), pitted with phages, were grown. Isolated

from these colonies on homologous and heterogeneous Bacillus pseudotuberculosis rodentium No 4 eighteen-hour cultures, the phage displayed a wide band of activity. In addition to the pseudotubercular cultures (41 of the 42 strains tested), it caused the lysis of virulent and avirulent strains of B. pestis (the S & R form) and certain strains (11 of 32) of the intestinal typho-dysentery group (R-forms). The phage was not active against the S-form of the latter group.

"Editor's note: Data concerning the isolation of a pure phage culture (from separate sterile patches) was not cited in the work."

86. Museum of Live Cultures Established in USSR

"Work of the Museum of Live Cultures," by N. A. Demina, Meditsinskaya Parazitologiya i Parazitarnyye Bolezni, Vol 26, No 2, Mar/Apr 57, pp 252-253

"In accordance with order No 205a of the Ministry of Health USSR, the Museum of Live Cultures of pathogenic and conditionally pathogenic microorganisms belonging to various categories -- Bacteria, Rickettsia, Viruses, Protozoa, Spirochetes, and Actinomycetes -- was organized in the USSR on 30 April 1955. Responsibility for the organization and direction of the Museum of Live Cultures was delegated to the State Institute for the Control of Sera and Vaccines. Five institutes were designated as affiliates of the museum and were made responsible for accumulating collections of cultures in accordance with their specialties. The Institute of Malaria, Medical Parasitology, and Helminthology, Ministry of Health USSR, was made responsible for assembling a collection of strains of Protozoa, Spirochetes, and Actinomycetes.

"The pursuance of research along the following lines is specified by a directive of the Museum of Live Cultures:

"1. The recording of cultures of bacteria occurring in the USSR and their registration

"a. Compilation of a list of cultures maintained in various laboratories of the Soviet Union and their registration

"b. Selecting cultures which can be catalogued and affixing catalogue designations to them

"c. Registration of the selected cultures in the All-Union Catalogue of Strains

"d. Registration of the indicated cultures in the International Catalogue of Strains.

"2. Study of existing strains: their classification, identification, and development of methods of culturing and maintaining them under conditions which ensure their stability, etc.

"Standardization of the specifications for recording, registering, handling, and studying strains of pathogenic and conditionally pathogenic microorganisms is highly significant. Centralized registration will give complete characteristics of strain predominance in the USSR and will provide for preservation of the strains registered.

"In accordance with what has been presented above, the Affiliate of the Museum of Live Cultures established at the Institute of Malaria, Medical Parasitology, and Helminthology, Ministry of Health USSR, asks institutes, sanitary-epidemiological stations, and other institutions having cultures of strains of Protozoa, Spirochetes, and Actinomycetes in their laboratories to report to the institute (Moscow, Malaya Pirogovskaya ul., d. 20, N. A. Demina) which of these strains can be registered in the Museum of Live Cultures and included in the collection of strains of cultures existing in the USSR.

"In carrying out this task it should be kept in mind that only those strains about which the following facts are known can be included in the collection: where, when, from what, and by whom (by what institution or laboratory) the strain was isolated; on what medium it was maintained from the time of isolation; approximately how many inoculations and passages it has undergone; to what extent the strain has been studied, what its characteristics are, and along what lines further study has been proposed. However, the absence of any of the points enumerated concerning an original individual strain which is of interest for one reason or another does not exclude the possibility of entering it in the catalogue of strains.

"After obtaining this information, three copies of the special catalogue label will be sent to the institution which sends it in, one of which will be kept in the institution; the other two will be forwarded to the affiliate of the museum: the first -- for the affiliate, the second -- to be sent to the Central Museum of Live Cultures.

"Order No 205a suggests that directors of institutions in which strains of microorganisms registered in the Museum of Live Cultures are kept select from among their coworkers responsible persons to whom the functions of correct handling and maintenance of strains can be delegated.

"In selecting culture strains for registration in the catalogue of the Museum of Live Cultures, it should be kept in mind that conditions which assure the preservation of these strains and guarantee their stability insofar as possible should exist or be created in the laboratory. In the event that strains are lost, or spontaneous changes in their

properties occur, the person responsible for sustaining and preserving the particular strain is obliged to report these conditions to the affiliate of the Museum of Live Cultures at the Institute of Malaria, Medical Parasitology, and Helminthology, Ministry of Health USSR. Once registered, a strain cannot be destroyed without the agreement and authorization of the affiliate of the Museum of Live Cultures.

"It is also a function of the Museum of Live Cultures to act as an intermediary in arranging exchange of strains of microorganisms both between laboratories inside the USSR and abroad. Institutions responsible for maintenance of particular strains are authorized to send available cultures to other laboratories in the USSR and abroad. In transmitting strains, all requirements specified in the Instructions confirmed by the Ministry of Health USSR, 19 March 1954, on the storage, handling, and disposition of pathogenic cultures of bacteria, viruses, and other organisms and bacterial toxins and poisons of animal origin should be observed."

87. New Method of Diagnosing Rabies

"Rapid Diagnosis of Rabies" Moscow, Meditsinskiy Rabotnik, 11 Apr 58, p 4

"Aspirant L. M. Trubina, under the direction of R. M. Shen, developed a rapid method for diagnosing rabies during life and posthumously at the Institute of Virology, Academy of Medical Sciences USSR.

"Using young mice for biological tests, it was possible to arrive at a reliable diagnosis within 4-5 days instead of the usual 10-12. A suitable and simple accelerated method was developed for obtaining fine paraffin sections of tissue to be examined and for contrast staining of this tissue."

88. Polysaccharide Fraction of Listerella monocytogenes

"A Method of Obtaining and Serologically Studying the Polysaccharide Fraction of Listerella Monocytogenes," by A. A. Kudryakov and G. Ye. Reznikova, Sb. rabot. Vologod. n.-i vet. opytn. st. (Collection of Works From the Vologodsk Scientific Research Experimental Veterinary Station), 1956, Issue 3, pp 58-61 (from Referativnyy Zhurnal -- Biologiya, No 23, 10 Dec 57, Abstract No 96911, by M. A. Gruzman)

"A method is described for obtaining and purifying the polysaccharide from a culture of L. monocytogenes. The obtained polysaccharide gave a clear ring reaction with Listerella serum even with a dilution of 1:70,000.

The polysaccharide did not react with normal or paratyphoid sera, thus displaying strict specificity. In an attempt to immunize two rabbits, the polysaccharide was not immunogenic. With the aid of a modified Pfluger method, according to the author, a pure polysaccharide possessing strict specificity can be isolated, however, it does not possess antigenic properties, i.e. is not a whole antigen."

89. Culturing the Virus of Lymphocytic Choriomeningitis

"Culturing the Virus of Lymphocytic Choriomeningitis on Growing Human Embryo Tissue," by M. I. Levi, Tr. Khar'kovsk. n.-i. in-ta vaktsii i syvorotok (Works of the Khar'kov Scientific Research Institute of Vaccines and Sera), 1956, 23, pp 281-284 (from Referativnyy Zhurnal -- Biologiya, No 23, 10 Dec 57, Abstract No 96692, by G. D. Zasukhina)

"Lung and brain tissue from human embryos was ground up. Two to three drops of virus-containing material was added to the tissue pieces. After 15-20 minutes, 2-4 drops of chick embryo extract was added; 8-10 drops of chick heparinized plasma, 14-18 drops of Erl's salt solution, tissue pieces, virus and chick embryo extract were then added to a Carrel flask. To the top of the congealed plasma were added 7-10 drops of horse serum, 15-20 drops of saline solution, and 1-2 drops of chick embryo extract. The supernatant liquid, obtained after carefully centrifuging the ground pieces of tissue, was used for the virus passage. To detect the presence of the virus in the tissue culture, the passage emulsion was introduced into the brains of white mice. Ten passages were conducted with the lung tissue and the virus was detected consistently. Guinea pigs infected with the material from the ninth passage did not become infected. Six passages were conducted with the brain tissue; the virus was detected only in the first passage."

90. Antigens of Listerella monocytogenes Studied

"On Bacterial Antigens From Listerella monocytogenes and Their Effect on the Rabbit (Intracutaneous Test)," by G. Zipplies, Research Institute for Vaccines, Dessau; Leipzig, Archiv fuer Experimentelle Veterinaermedizin, Vol 11, No 5, 1957, pp 816-834

The trichloroacetic-acid method was used to obtain a component from strains of Listerella monocytogenes which can be precipitated with acetone or alcohol, is soluble in water, and mol-positive; and a component which is precipitated by trichloroacetic acid, mol-negative, but positive to biuret, ninhydrin, and sulfosalicylic acid. Both fractions proved to be

antigens in the rabbit experiment and produced characteristic changes in the blood. They were pyrogenic. These extracts were obtained from the so-called I-forms of the laboratory strains or from those which had dissociated to a great extent into S and I-colonies. Further experimentation should show whether, here too, as in the case of gram negative bacteria, the smooth forms are rich in carbohydrates and deficient in protein, whereas the opposite conditions prevail in the case of the rough forms, in which the pyrogenic properties enter into the protein phase. The latter condition was observed even in these experiments.

For a skin reaction to be produced in rabbits, using the above fractions as antigens, through intracutaneous administration of 0.1 milliliter with about 0.25-mg effective substance, the animals must be, or must have been, in antigenic contact with living Listeria germs. Additional experimentation should show whether, with intensively prepared animals (in the sense just mentioned) and with fractions obtained by other methods, the results might be improved.

Suspensions of dead bacteria can likewise produce a skin reaction in sensitized rabbits.

91. Chinese Maintain Pure Strains of Toxoplasma and Rickettsia Obtained From Material of Mixed Infection by Serial Passage

"Studies on the Isolation of Pure Strains of Rickettsia and Toxoplasma From Material of Mixed Infection," by Yu En-shu (于 恩 淑), Fukien Health and Epidemic Prevention Station (福 建 防 疫 站); Peiping, Chung-kuo Shou-i-hsueh Tsa-chih (Chinese Veterinary Journal), No 2, 1958, pp 38-40

This article reports controlled experiments conducted in a search for a method by which pure strains of rickettsia and toxoplasma could be isolated from material of mixed infection and passed through white mice. The author points out that such a method is extremely important from the standpoints of etiology and epidemiology. The study was inspired by past attempts to recover the tsutsugamushi rickettsia from infected rabbits by animal inoculation. In those earlier experiments, rickettsiae isolated from the liver and spleen tissues of rabbits disappeared after the third serial passage in mice. Instead, there appeared on the ascitic smears large concentrations of toxoplasma, which remained through many subsequent serial passages. Nevertheless, the possibility of latent rickettsial infection was ever present.

In preliminary experiments to find factors which would destroy one of the organisms without affecting the other, the author discovered that over an hour of refrigeration at minus 18 to minus 20 degrees centigrade caused toxoplasma to lose its infectivity completely but had no affect on rickettsia. On the other hand, a 0.5-0.1-percent garlic extract killed rickettsia in an hour at 37 degrees centigrade but a concentration of less than one percent had no effect on toxoplasma.

Therefore, taking advantage of these two organisms' different sensitivities to low temperatures and to a chemical substance in garlic, a technique was developed by which "pure strains of rickettsia and toxoplasma were isolated from material of mixed infection and their purity maintained in white mice for 5-7 generations." Details of biological and serological tests which indicated that each isolated strain was free from any latent form of the other are also presented.

92. Influenza Virus Studied in Hungary

"Virus Has Been Imprisoned So That Science Can Observe It," by K. Gy., Budapest, Esti Hirlap, 29 Nov 57, p 3

The laboratory of the Department of Virology of the National Institute of Public Health (Orszagos Kozegeszsegugyi Intezet) is equipped with a 2-meter electron microscope.

According to Dr Istvan Hollos, head of the electron microscope laboratory, the institute has been investigating the virus of Asian influenza.

Communicable Diseases

93. Huddleson Reaction Tested for Detecting Brucella in Milk Products

"The Problem of the Suitability of the Slide Method of Agglutination (Huddleson Reaction) for Determining Contamination of Milk Products With Brucella," by T. Ye. Klyuchareva, A. S. Polyakova, and N. S. Yesikova, Laboratory of Tashkent City Sanitary-Epidemiological Station; Moscow, Zhurnal Mikrobiologii Epidemiologii, i Immunobiologii, Vol 28, No 9, Sep 57, p 31

This article is an evaluation of the Huddleson method for detecting Brucella in milk products in the above-mentioned laboratory, where the method has been in use since August 1956. A table shows results of investigating six milk products in this manner. Analysis of the data obtained revealed that those products in which acidity was higher than 80° Terner gave positive reactions. In a number of cases it was possible to examine the fresh milk from which the products giving a positive reaction had been prepared; the agglutination reaction of the initial material was negative in these cases. In special experiments arranged to determine the relationship between positive agglutination reactions and the degree of acidity in milk products, samples of milk exhibiting negative Huddleson reactions were fermented. Results are summarized in a table, which shows that a positive reaction was obtained in all samples of milk in dilutions of 1:50 and 1:100 when acidity was higher than 80° Terner. The agglutination titer increased in proportion to the degree of increase in acidity.

Agglutination was performed with serum obtained by filtration through two layers of gauze and ordinary writing paper or, in the case of curdled milk, through filter paper alone. The serum obtained was subsequently centrifuged to prevent the appearance of elements which could simulate agglutination, but the results remained unchanged.

It was concluded that the Huddleson reaction was not specific for milk products in which the acidity exceeded 80° Terner.

94. Infection Site and Course of Tularemia

"The Importance of the Infection Site to the Course of Tularemia," by Ye. I. Kelytman, Tr. Tomskogo. n.-i. ni-ta. vaktsin i syvorotok (Works of the Tomsk Scientific Research Institute of Vaccines and Sera), 1956, No 8, pp 220-223; (from Referativnyy Zhurnal -- Biologiya, No 23, 10 Dec 57, Abstract No 96874, by A. S. Shevelev)

"The reaction of guinea pigs to the introduction of 1-20 microbes of a virulent tularemia bacteria strain into various parts of the body was investigated. Pigs, infected in the fleshy part of the fore foot, lived the longest; all 17 pigs undergoing the test died later than the 15 control animals which were inoculated subcutaneously in the inguinal region. The introduction of the bacteria into the lungs was most lethal; ten of the 11 pigs died 2-3 days earlier than the control animals. In addition, three of the four animals infected through the kidneys died earlier than the controls, and three of the seven infected through the spleen died earlier than the controls, two of the seven pigs infected through the liver died earlier than the controls (later -- three, and simultaneously with the controls -- two). Necrotic foci appeared in the lungs only with direct infection into the lungs."

95. Rickettsia burneti Viable for 125 Days in Milk

"Survivability of Rickettsia burneti in Milk and Milk Products," by R. I. Zubkova, Institute of Epidemiology and Microbiology imeni Gamaleya; Moscow, Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii, Vol 28, No 9, Sep 57, pp 42-46

The purpose of the research reported in this article was to determine how long Rickettsia burneti could survive in milk and various milk products (Kefir, acidophilin, clabber, curds) and to investigate the resistance of these products to the effects of temperature. The experiments were performed with whole, artificially infected milk, sterilized at 5 atm. for 20 minutes. One series of titered, standard material prepared from a culture of Rickettsia Burneti (Grita strain) on chick embryo yolk sacs, vacuum dried and preserved in a refrigerator at 4° C, was used for infection. The minimum infecting dose was 10^{-7} after dilution of the material with whole milk. Chick embryos and frequently guinea pigs were used as experimental animals. Milk from one goat was employed in all series of experiments. A table is included to show the ability of R. burneti to survive in artificially infected milk in relation to temperature and duration of heating.

The following conclusions are presented on the basis of results obtained:

"1. Rickettsia burneti survived for 125 days at room temperature in artificially infected milk, and for 273 days (the length of observation) at 4°.

"2. The current method of pasteurization does not guarantee disinfection of milk from R. burneti; these organisms survive heating in whole milk up to 90° for an hour and die in minutes at 100°.

"3. R. burneti survive in curds and one-day kefir but die in clabber and acidophilin."

96. Venereal Disease Declines in Hungary

"A Good Report From the Dermatologists" (unsigned article); Budapest, Esti Hirlap, 22 Dec 57, p 3

At the national congress of dermatologists Dr Ferenc Foldvari, university professor and director of the Institute of Dermatology and Venereal Pathology (Bor es Nemikortani Intezet), announced that the incidence of venereal disease is decreasing in Hungary. He added that the length of treatment can be greatly reduced through use of penicillin.

Dr Istvan Karolyi, deputy director of the institute, maintained that during the past 10 years Hungary has risen to first place in the prevention of venereal disease, even on an international scale. This is due to free medical care and the extension of the welfare network.

According to Karolyi, "the most dangerous venereal disease" has virtually disappeared in Hungary: in 1957, there were only 37 new cases of syphillis in Hungary. Although there were more cases of gonorrhea, the incidence of this disease has declined by 80 percent in the past 10 years.

Epidemiology

97. Spontaneous Outbreak of Tularemia in Birds

"The Problem of Spontaneous Infection of Birds With Tularemia," by N. I. Igolkin, Tr. Tomskogo n.-i. in-ta vaktsin i syvorotok (Works of the Tomsk Scientific Research Institute of Vaccines and Sera), 1956, No 8, pp 166-169 (from Referativnyy Zhurnal -- Biologiya, No 23, 10 Dec 57, Abstract No 96875, by A. S. Shevelev)

"Eighty-eight birds (14 species) trapped in a swamp region, rat-type, tularemia focus were studied. In 1955, the tularemia pathogen was isolated from three species of birds; Crex crex, Sterna hirundo, and Cortunix cortunix. All the infected birds were caught in an area inhabited by water rats. In investigations of 43 birds (11 species) in 1956, the tularemia pathogen was not isolated. During this period, the pathogen was not isolated from mammals or arthropods, which indicates the extinction of the tularemia epizootic."

98. Role of Chipmunk as Tick-Borne Encephalitis Carrier

"The Chipmunk as a Temporary Carrier of Tick-borne Encephalitis Virus in the Tomsk Focus," by N. I. Igulkin, M. K. Tyushnyakova, and Yu. V. Fedorov, Tr. Tomskogo n.-i. in-ta. vaktsin i syvorotok. (Works of the Tomsk Scientific Research Institute of Vaccines and Sera), 1956, No 8, pp 133-137 (from Referativnyy Zhurnal -- Biologiya, No 23, 10 Dec 57, Abstract No 98202, by T. N. Dunayeva)

"In the Tomsk focus of tick-borne encephalitis, Ixodes persulcatus is a vector of the virus during all seasons of the year. The chipmunk is one of the basic hosts of this species. Of 105 chipmunks trapped in April-September 1955, ticks were found on 47 (a total of 151 ticks). The ticks are found on the chipmunks in great numbers in June and July when the tick indexes (nymphs and larva) are respectively 7:1 and 3:1 (on all animals investigated, including nondiseased ticks). During the rest of the year the index amounted to 0.3-1.3 ticks. Two strains of tick-borne encephalitis virus were isolated during June-August after virological investigation of the chipmunks."

Hematology

99. Blood Preserved in Vitaminized Mineral Water of Armenia Is Used Intravenously as Antishock and Plasma Substitute

"Preservation of Blood in Vitaminized Dilizhan and Ankavan Mineral Waters. Use of Mineral Water of Armenia for Intravenous Injections," by S. A. Akopyan, Nauchnye Trudy Yerevanskogo Universiteta, Seriya Biol. Nauk. (Scientific Works of Yerevan University, Biological Science Series), No 54, 6, 1956, 119-126, (from Meditsinskiy Referativnyy Zhurnal, No 6, Section 1, 1957, p 97)

It has been established that the mineral water of Dilizhan and Ankavan (Armenia) stabilized with vitamin C retains its natural state for a long time, and the iron which the water contains remains in its active and ferrous form. This vitaminized water was used in experiments on rabbits which received 15-20 ml/kg body weight, and the morphological and biochemical properties of blood were restored, on the average, 5 days sooner than in animals that had not received the mineral water treatment. With the use of vitaminized mineral water the blood was restored significantly sooner.

The toxic dose of the vitaminized mineral water used intravenously has been established. Preliminary research has been completed which indicates the possibility of preserving blood in vitaminized mineral water. It has been established that the blood is preserved better and for a longer time by adding glucose and saccharose to its preservative.

In experiments on shock reaction in dogs, the reaction in response to the transfusion of human blood preserved in vitaminized mineral water was weaker than after transfusion of blood preserved by the usual methods.

In conclusion, mineral water of Armenia may be used intravenously as an antishock agent and as a plasma substitute.

100. Changes in Blood Inorganic Phosphorus Level and in Blood Sugar Content Dependent on Rate of Oxidative Processes

"Correlation of Glycemia and of Phosphatemia With Respect to the Intensity of Oxidative Processes," by T. L. Bykhotseva, Sb. Rabot. Leningr. Vet. In-ta (Collection of Works, Leningrad Veterinary Institute), 1956, Vol 18, 111-119 (from Referativnyy Zhurnal -- Khimiya, Biologicheskaya Khimiya, No 24, 25 Dec 57, Abstract No 26624)

Decreased rate of oxidative processes caused by subcutaneous administration to rabbits of large doses of chloral hydrate, or by the intravenous administration of $NaNO_2$, more than doubles blood sugar level and raises the level of inorganic phosphorus by 41-43 %.

Increased rate of oxidative processes may be accompanied by both rise and fall of blood sugar content (depending on the level of adrenalin or of insulin).

Analogous results are obtained after sugar ingestion. Therefore, changes in inorganic phosphorus level in the serum are independent of blood sugar level and are determined only by the intensity of oxidative processes.

101. Research on Effect of Insulin and Largactil on Blood Sugar Content in Hypothermia

"Research on the Effect of Insulin and Largactil on Blood Sugar Content in Experimental Hypothermia," by K. Karajovifidis, Acta Physiol. Polon., 1956, 7, No 4, 469-476 (Polish) (from Referativnyy Zhurnal -- Khimiya, Biologicheskaya Khimiya, No 24, 25 Dec 57, Abstract No 26258)

In experimental hypothermia on rabbits under evipal narcosis when body temperature falls to 25°, blood sugar level rises on the average, from 133.8 up to 165.4 mg %. After sugar ingestion, blood sugar level of animals under hypothermia returns to normal more slowly than in control animals.

Insulin is less effective during hypothermia (on the average by 35% as compared with 50% under normal conditions) in decreasing blood sugar content, and also in further decreasing body temperature.

Largactil, under the same conditions, aggravates hypothermic hyperglycemia.

102. Lvov Scientific Institute Describes Expansion of Research on Problems of Hematology and Hypothermia

"Blood Restores Life," by M. Mirskiy; Moscow, Meditsinskiy Rabotnik, 14 Jan 58, p 3

The author describes an experiment on dogs under hypothermia which lowers body temperature and slows metabolism--both important factors in delicate intracardiac operations.

Docent D. G. Petrov and his scientific co-workers Z. P. Fedorova, Ye. A. Tkach, and V. D. Yedkina who are working at L'vov Scientific Research Institute for Blood Transfusion are studying the effect of blood transfusion and of blood substitutes on animals under hypothermia while suffering from blood loss, and their reports tell of favorable effects of transfusion under the combined effects of hypothermia and blood loss.

The L'vov Scientific Research Institute for Blood Transfusion is investigating pressing problems of hematology and blood transfusion, and one of these projects is the discovery of new effective methods for blood preservation. A method suggested by Prof I. I. Fedorov, and developed at this institute is the method of preserving blood in a preservative that contains 96% ethyl alcohol. Special research indicates that processing blood by this method (also called the alcohol-glucose-citrate method) preserves blood for long periods of time without any signs of hemolysis.

Experimental and clinical studies have proved that repeated transfusions using alcohol-glucose-citrated blood produce favorable therapeutic results in patients suffering from suppurative and septic diseases. V. I. Baydak has obtained interesting results on the effect of such blood on protein metabolism after massive blood loss.

Interesting research is proceeding on a two-stage method for preparing erythrocyte suspension. The suggestion for enriching saccharose-glucose-citrate solution used for preserving erythrocyte mass by the addition of ethyl alcohol has proved very effective. The preservative obtained by this method safeguards erythrocytes from the usual biochemical changes and prevents their hemolysis for 30-40 days and even longer. The alcohol-saccharose-glucose-citrate solution, as has been established, can be used for preparing erythrocyte suspension by the two-stage method at departments for blood transfusion at rayon hospitals.

New hemotherapeutic preparations -- protein hydrolysates -- such as "aminokrovin" have been developed in recent years at this institute. R. N. Akimova, Senior Scientific Collaborator, has used "aminokrovin" in combination with erythrocytes and has reported in detail the therapeutic effects of this combination.

The Lvov laboratory is well equipped with all necessary items for scientific research, and the experimental base is constantly expanding. Work will soon start on the construction of a biophysics biochemistry laboratory This addition to the laboratory will be equipped with new instruments for work with radioactive isotopes.

Immunology and Therapeutics

103. Cutaneous Methods of Revaccination Against Brucellosis Evaluated

"Analysis of Data and Evaluation of the Cutaneous Method of Revaccinating Meat-Combine Workers Previously Inoculated Against Brucellosis," by L. N. Zhukova, Sverdlovskaya Oblast Sanitary-Epidemiological Station; Moscow Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii, Vol 28, No 9, Sep 57, p 31

The effectiveness of cutaneous revaccination against brucellosis was investigated among 392 workers of meat combines in Sverdlovskaya Oblast, where brucellar cattle had been slaughtered and meat from brucellar animals had been processed. Persons exhibiting positive, doubtful, and negative serological and allergic reactions were revaccinated by the cutaneous method. No general or local reactions were reported; one with a slight inflitrate developed.

Results of the revaccination were tested by serological reactions (Huddleson and Burnet tests) after 2 weeks, at which time definite immunological shifts were noted. The index of the opsono-phagocytic reaction also increased.

Evaluation of the cutaneous revaccination method on the basis of the results obtained in these tests led the author to conclude that the method was simple and suitable, required no preliminary screening for immunological reactions, did not cause local or general reactions of the organism, and produced immunological shifts within 2 weeks of revaccination. Further testing is required to determine the epidemiological effectiveness of the method.

104. Phagocytic Therapy of Brucellosis

"Phago therapy of Experimental Brucellosis (A Preliminary Report)," by M. S. Drozhevkina, T. I. Kharatinova, and V. S. Uraleva, Tr. Rostovsk.-n.-D. gos. n.-i. protivochumn. in-ta. (Works of the Rostov-na-Donu State Scientific Research Anti-plague Institute), 1956, 10, 413-431; (from Referativnyy Zhurnal -- Biologiya, No 23, 10 Dec 57, Abstract No 96640, by M. A. Gruzman)

"The experiments were conducted on rabbits and guinea pigs. The agglutination titer of the infected animals receiving phage therapy was much higher than the titer obtained from those animals which did not receive the phagocyte. After the first course of phage therapy, an allergy skin test was much more sharply pronounced in the animals receiving the phage than in the control animals. After the second course of phage therapy, which was conducted 10 days after the first, the allergy reaction disappeared in some of the animals and was markedly decreased in the others. At the same time, a sharp increase in reaction was noted in the control animals. After the administration of the phages to healthy animals, allergy changes in the organism were not observed. Leshchinskiy-Kavetskiy tests on noninfected animals which received the phage were more strongly expressed than tests on healthy animals which did not receive the phage, thus indicating changes in physiological reactivity. A noticeable increase in the test index was recorded with infected rabbits receiving the phage, while at the same time, a decrease in the index was noted in animals which did not receive the phage. Because of the phage action, the rate at which the organism eliminates the pathogen is increased.

"The author contends that the mechanism of the phage action, in addition to its direct effect on the pathogen, is expressed by action on the nervous system which leads to the activation of the natural defense mechanisms of the microorganism."

105. Study of Efficacy of Live Tularemia Vaccine

"The Problem of the Length and Intensity of Postvaccinal Immunity Against Tularemia," by O. P. Khizhinskaya and V. M. Stupnitskaya, Tr. Rostovsk.-na-D gos. n.-i. protivochumn. in-ta. (Works of the Rostov-na-Donu State Scientific Research Antiplague Institute), 1956, No 10, pp 205-207; (from Referativnyy Zhurnal -- Biologiya, No 23, 10 Dec 57, Abstract No 96870, by A. S. Shevelev)

"An occurence of tularemia is described even though a marked positive test for tularemia was recorded 5 years after immunization with a live tularemia vaccine. The tularemia developed a week after a doctor came in contact with some infected material. The infection, apparently, was transmitted through the conjunctiva of the eye, since a mild form of tularemia developed in the eyes. The disease continued for 3 months. Mice infected with the conjunctiva extract died as a result of tularemia."

106. Study of Immunogenic Properties of Vaccine Strain of B. tularense

"Study of the Immunogenic Properties of a Vaccine Strain of B. tularense During the Process of Growth and Division at a Temperature of 37°," by T. I. Puchkova, Tr. Rostovsk.-na-D. n.-i. protivochum. in-ta. (Works of the Rostov-na-Donu Scientific Research Antiplague Institute), 1956, No 10, pp 197-199 (from Referativnyy Zhurnal -- Biologiya, No 23, 10 Dec 57, Abstract No 96868, by A. S. Shevelev)

"A culture of a vaccine strain of the tularemia microbe, at various intervals after the beginning of growth at 37°, was administered subcutaneously in standard doses to mice and guinea pigs. Initially the virulence of the vaccine strain when administered to mice increased by degree as the culture grew older. Maximum virulence (loss of 15 out of 20 mice) was observed after infection by cultures grown at 37° from 24 to 48 hours; 3-day cultures produced a loss of 9 out of 20 mice; and 5-day cultures, one mouse. Cultures grown at 37° for 5-10 days became avirulent. One to 2-day cultures displayed greater immunogenity in the vaccination of mice. With a longer growth time at 37°, a progressive lowering of immunogenity was observed. In the experiments on guinea pigs, complete immunogenic properties were observed only with 24-36-48-hour cultures. The 12-18-hour and 3-5-day cultures produced very weak immunity (loss of one out of ten pigs in immunity tests). When the pigs were immunized with 10-15 day cultures, immunity tests produced a loss of seven out of 11 pigs in each group."

107. Immunological Reactions in Tularemia

"Immunological Reactions in Persons Who Have Had Tularemia and Vaccinated Persons," by V. P. Sekundant, Khashchevarskiy Rayon Hospital, Kirovogradskaya Oblast; Kiev, Vrachebnoye Delo, No 2, 1958, pp 175-180

This report describes a laboratory investigation of persons who had had tularemia and vaccinated persons; the investigation was performed 7-9 years after an outbreak of this disease. The following three reactions were employed in the tests: the intracutaneous tularin test (allergic), the agglutination reaction with tularemia diagnosticum (serological), and the opsono-phagocytic reaction (OPR). It is noted that the outbreak had been of murine origin; infection occurred chiefly through water and food products. These reactions mentioned above are described in detail. The largest number of persons examined had had tularemia; others had been inoculated against the disease, and some had been present in the epidemic focus but had not been inoculated and had not become infected. Control groups were also checked.

It is reported that the epidemic consisted primarily of the visceral form of tularemia, with small percentages of the anginous bubonic, and bubonic-ocular forms also occurring sporadically. Inapparent (asymtomatic) forms are offered as a possible explanation for the occurrence of immunological reactions in ostensibly healthy individuals. A significant immune contingent was present in the epidemic area but did not contract the disease.

Results of the tularin and agglutination tests are discussed. It is mentioned that inoculation with live tularemia vaccine caused agglutinins to appear in the blood of vaccinated persons; positive serological reactions were obtained 5-7 years after vaccination. The author points out that serological reactions can be used to detect the chronic form of tularemia in old foci.

Two tables show the agglutination titers of sera in persons examined and secondary serum reactions, and results of the opsono-phagocytic reaction in the diagnosis of tularemia. Dry live tularemia vaccine was used as antigen in these tests. These results are analyzed in the text. The antigenic similarity between the tularemia and brucellosis pathogens is considered.

It is concluded that the opsono-phagocytic reaction is as specific for tularemia as for brucellosis. This index was most pronounced in persons who had had tularemia. The opsono-phagocytic reaction with tularemia antigen is recommended for use with other immunological reactions as a method of determining the maintenance and intensity of immunity to tularemia in persons who have had the disease and in vaccinated persons. This reaction is also considered to be prospective for detecting chronic tularemia among persons in old epidemic foci.

108. Chinese Test Methods for Preparing Encephalitis Vaccine

"Studies on Methods for Preparing B-Type Encephalitis Vaccine. I. Effect of the Type of Diluent and Partial Removal of Mouse Brain Tissue on the Protective Titer of Vaccine in Storage," by Liu Yuan-yuan (柳元元) and Li P'ei-chun (李佩钧), Department of Virology, Chinese Academy of Medical Sciences; Peiping, Wei-sheng-wu Hsueh-pao (Acta Microbiologica Sinica), Vol 5, No 4, Nov 57, pp 444-450

This item presents the details of experiments undertaken to compare the quality of mouse-brain-tissue B-type encephalitis vaccine prepared by using a physiologic saline diluent with the quality of that prepared by using a 5-percent lactose diluent of pH 7.6 and to determine whether partial removal of mouse brain tissue by centrifugation has any effect on the protective titer and keeping quality of such vaccines.

The Ching-wei-yen$_1$ Strain, which has been subjected to 19-20 serial passages in white mice, was used in the preparation of the vaccines after a method described in 1952 by Wang I-min (王逸民) and Huang Chen-hsiang (黄祯祥) for making formaldehyde inactivated encephalitis vaccine. Data comparing the protective titers and keeping qualities of both types of vaccine, with and without the removal of brain tissue, are presented in tables and graphs and discussed.

In their introduction, the authors state that the Chinese have been investigating formaldehyde-inactivated B encephalitis vaccine since Wang and Huang in 1949 reported their successful preparation from virus strains isolated in China. However, several important problems remain unsolved: (a) the duration of effective protective titer, (b) whether elimination of mouse brain tissue would affect the immunizing capacity, and (c) whether the protective titer can be raised by the use of other diluents.

The general opinion expressed in the few published reports on the investigation of these questions is that the removal of mouse brain tissue would lower the titer (Sabin et al, 1943) and, as pointed out by Shubladze and others in 1954, an effective protective titer cannot be maintained longer than 6 months in B encephalitis vaccine.

Contrary to these opinions, the authors found that, for both saline and lactose vaccines, the removal of 50-54 percent of the mouse brain tissue by centrifuging at 2,000 rpm for 20 minutes did not cause a protective titer lower than that of vaccine of the same type from which no brain tissue had been removed. In fact, in a few experiments, the protective titer was slightly higher in the former than in the latter. This condition was obtained in tests which were run both right after preparation of the vaccine and after 12 months' storage. According to the authors, this has practical significance, for it means the elimination of many adverse side effects which would otherwise result from the use of vaccine with high brain tissue content.

It was also found that the keeping quality of B encephalitis vaccine prepared with 5-percent lactose solution as diluent was superior to that of vaccine prepared with physiological salt solution as diluent. The protective titer of the former dropped only 29-37 percent after a year's storage at 4-5 degrees centigrade, whereas that of the physiological salt solution vaccine stored under the same conditions dropped 60-74 percent after 6 months and 91-96 percent after one year.

From the results of their experiments, the authors deduced the following concerning the effect of formaldehyde on the immunizing capacity of the vaccine: In the preparation of vaccine, the point at which formaldehyde is added as an inactivating agent may affect the immunizing capacity of the finished product. If added after the removal of brain tissue, the formaldehyde content of the suspension may be too high and the antigenic property of the virus would be destroyed. A lower protective titer would result. The optimum amount of formaldehyde may possibly vary with the protein content of the virus suspension.